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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TOXIC SUBSTANCES
CHEMICAL INFORMATION DIVISION
Rm. E447, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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79-1501. Anonymous **Pheromone aids red scale control.** *Agric. Res.* 27(7): 8-11; 1979.

An alternate to the use of chemical pesticides for the control of lemon infestation by red scale in California has been developed. Over the past 10 yr, 250,000 was alloted to isolate and synthesize a sex pheromone which would confuse the male members of this species and prevent successfull mating. Work on the project was begun in 1971, and by 1976, the female sex pheromone was isolated and synthesized commercially. Besides being used for red scale population control in lemon orchards, the pheromone may also be used as an attractant in special traps, designed to monitor population growth, to indicate whether more extensive protection for trees by conventional pesticide treatments will be necessary.

79-1502. Wauchope, R. D. (South. Weed Sci. Lab., Stoneville, MS 38776) **Pesticides in runoff water.** *Agric. Res.* 27(7): 11; 1979.

The results of a 10 yr research project on the presence of pesticides in runoff water are discussed. Most commercial pesticides will experience total losses of 0.5% or less of the applied amounts if severe rainfail conditions do not occur. Organochlorine insecticides maybe lost up to 1%, due to their long persistence regardless of weather conditions. Soil surface applied wettable powder formulations of some pesticides maybe lost, up to 5% of the applied amounts, depending on slope and weather conditions because the powders are easily dislodged from the soil surface by rain. Since most pesticides are relatively nonpersistent, it is likely that most of the applied amounts will degrade before rainfall occurs. Altered tillage practices are being studied to keep pesticide contamination of runoff water to a minimum. The most insoluble pesticides (10 ppm or less) and those that bind strongly to clay particles, such as the arsenicals and paraquat, are carried with the clay in runoff in the sediment phase. Most pesticides, however, are carried by water runoff, and this phase of pesticide loss constitutes the biggest problem of contamination.

79-1503. Ali, A.; Mulla, M. S. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Impact of the insect growth regulator diflubenzuron on invertebrates in a residential-recreational lake.** *Arch. Environ. Contam. Toxicol.* 7(4): 483-491; 1978. (20 references)

The effects of the insect growth regulator (IGR) diflubenzuron on planktonic, nektonic, and benthic invertebrates in a residential-recreational lake were studied during the period of April to October 1977. A 25% WP formulation of the IGR was applied at 156 g AI/ha (0.012 ppm) to the entire lake surface, once on April 26, and again on August 24. The April treatment severely affected populations of the cladocerans *Daphnia laevis* Birge, *Ceriodaplnia* sp., *Bosmina longirostris* (O. F. Muller), and the copepods *Cyclops* spp. and *Diaptomus* sp., completely eliminating them within 1 wk posttreatment. The amphipod *Hyalella azteca* (Saussure) was completely eliminated within 4 wk remaining absent for more than 6 mo after treatment. Nymphs of the mayfly, *Caenis* sp., were reduced 99%, recovering in 6 wk posttreatment. The second application in August caused complete elimination of *Cyclops* and *B. longirostris* within 1-2 wk, the former recovering in 4 wk and the latter in 8-9 wk after the treatment. *Caenis* also was adversely affected, recovering in 4-5 wk posttreatment. The insect growth regulator (IGR), diflubenzuron, has recently been successfully tested against a variety of terrestrial and aquatic pest and vector insects, including immature mosquitoes, chironomid midges, and blackflies under laboratory and field conditions. Diflubenzuron has been evaluated for the control of several species of nuisance midges in some chironomid breeding sources, such as residential recreational lakes and water percolation basins and ponds. Another study was made to elucidate the adverse effects of diflubenzuron on nontarget invertebrates when applied to the entire lake area for chironomid control in a small residential recreational lake in southern California. (Author abstract by permission, abridged)

79-1504. Weinberger, P.; Pomber, L.; Prasad, R. (Biol. Dep., Univ. Ottawa, Ottawa, Ontario K1N 6N5, Canada) **The effect of spray treatments on some germination characteristics of white pine and yellow birch.** *Bull. Environ. Contam. Toxicol.* 21(3): 365-370; 1979. (10 references)

Studies were carried out to determine the effects of the insecticide fenitrothion on the germination of white pine and yellow birch seedlings. Seeds were collected from a region in which the pesticide has been sprayed for several years at a rate of 56-112 g/ha. Control seeds were gathered from an area which had never been sprayed. The overall germination percentage, germination rates and fresh and dry weights of the root hypocotyl were lower in seeds from sprayed areas. The differences decreased as stratification time increased. Seedling growth recovered after the initial depression in germination.

79-1505. Havlik, B.; Hanusova, J. (Inst. Hyg. & Epidemiol., Prague, Czechoslovakia) **K vyskytu organickych sloucenin rtuti v povrchovych vodach. [On the occurrence of organic mercury compounds in surface waters.]** *Cesk. Hyg.* 24(2): 84-93; 1979. (56 references) (Czech)

The occurrence, mode of metabolism in the biocoenotic cycle, and degradation of organic mercury compounds in surface waters is discussed. The isotopic exchange technique is recommended for the determination of mercury compounds in water, and other methods of organomercury analysis are presented. The analysis of mercury residues in fish has been shown to be the most sensitive method for the monitoring of mercury concentrations in samples of drinking water, Prague river water, and sediments. The analysis of sediments is recommended for the determination of mercury in surface waters of receiving bodies. Methylmercury and phenylmercury should be monitored in drinking water only in cases where accidental contamination is suspected.

79-1506. Ciaccio, E. I. (Hahnemann Med. Coll., Philadelphia, PA) **Dioxin contamination.** *Chem Eng. News* 57(16):

3; 1979. (2 references)

In a letter to the editor, a professor of toxicology points out that the source of dioxin contamination around the Dow plant in Michigan may be due to disposal methods of this compound by the plant itself. The claim is supported by a number of articles published earlier which point out that the Dow Chemical Company has been burning its liquid and solid chemical wastes at its Midland, Michigan, complex for almost 40 yr, and that dioxins may be bound to particulate matter that can pass through incinerations operating at temperatures as high as 1150°C. It is suggested that the company's efforts should be spent in researching safer methods of disposal of this highly toxic compound instead of searching for ways to place the blame for the contamination of the environment on other sources.

79-1507. Elliott, M.; Janes, N. F. (Dep. Insectic. & Fungic., Rothamsted Exp. Stn., Harpenden, Herts. AL5 2JQ, England) **Synthetic pyrethroids - a new class of insecticide.** *Chem. Soc. Rev.* 7(4): 473-505; 1978. (163 references)

A detailed description of synthetic pyrethroids is presented in this extensive literature review. The topics covered include structural variations and insecticidal activity, a chronological survey of effective combinations, synthesis of components of pyrethroid esters, photochemistry, structure-toxicity relationships of pyrethroids in vertebrates, and various other aspects of biological activity.

79-1508. Done, A. K. (Author address not given) **The toxic emergency.** *Emerg. Med.* 11(4): 186-187, 191-193, 197; 1979.

Herbicides and fungicides are often less toxic than pesticides aimed at members of the animal kingdom, but nevertheless, still present puzzling problems to doctors faced with handling cases of poisonings by these substances. A summary of the main classes of fungicides and herbicides is given which describes the major site of action of these compounds in humans and possible antidotes and therapies that may be used against fungicidal and herbicidal toxic action. The chlorophenoxy compounds the most toxic of which is 2,4-D, produce nausea and vomiting, fatigue, disorientation, or even coma and may be treated by emptying the stomach and giving quinidine to counteract myotonic symptoms. Hypermetabolism is associated with poisoning by dinitrophenols and the principal therapeutic aim in treatment of patients is the reduction of this condition by careful control of the fluid and acid-base balance. The carbamate fungicides and herbicides including eptam and barban are not as toxic as insecticidal carbamates, however symptoms of diarrhea, disorientation, and possibly coma may result, and should be treated by emptying the stomach, minimimization of fluid loss, and artificial respiration if needed. The triazines, in particularly amitrole, may cause adenocarcinomas after prolonged exposure and are forbidden for use where residues could persist on food crops. Patients intoxicated with arsenical compounds should be given intravenous fluids or blood to make up for losses from the gastrointestinal purging that is common to ingestion of the soluble salts. Dimercaprol may be given immediately if arsenical poisoning is even suspected. Other miscellaneous fungicides and herbicides of indefinite toxicity are also discussed.

79-1509. de Serres, F. J. (NIEHS, Research Triangle Park, NC 27709) **Introduction: Utilization of higher plant systems as monitors of environmental mutagens.** *Environ. Health Perspect.* 27: 3-6; 1978. (9 references)

The use of short-term tests to predict adverse effects on the human population after long-term exposure to various chemicals has found its way into the recent guidelines for testing pesticides. These tests now include short-term mutagenicity factors which aid in properly enforcing the Federal Insecticide, Fungicide and Rodenticide Act. Pesticides which are genetically active are not only a hazard to the human population, but to other organisms also. Some recent studies have shown pesticides are not only mutagenic in plants, but that extracts of these plants in turn were mutagenic in assays on laboratory organisms. The use of plant systems for early detection of possible mutagenesis of chemicals is discussed.

79-1510. Grant, W. F. (Genet. Lab., McGill Univ., St. Anne de Bellevue, Quebec H0A 1C0, Canada) **Chromosome aberrations inplants as a monitoring system.** *Environ. Health Perspect.* 27: 37-43; 1978. (93 references)

The use of higher plants in mutagenicity screening of environmental chemicals is discussed. The types of chromosome abnormalities induced by pesticides are described. Colchicine mitosis, chromatid exchange, chromosome dissolution, polyploidy, chromosome fragmentation, and chromosome stickiness have been observed in plant cells. Advantages of using plant systems include the fact that chromosome organization in plants is similar to that in humans, mutagenic effects can be studied under a wide range of environmental conditions, and plants are easy to grow, with a short generation time in some. In addition, a positive correlation has been found between the aberrations induced by the same chemical in plant root-tip cells and in cultured mammalian cells. Examples of cytogenetic studies on effects of pesticides on higher plants are described. Pesticides displaying C-mitotic activity include barban, benomyl, carbaryl, chlorpropham, propham, diallate, BHC, the mercurials, and dieldrin.

79-1511. Plewa, M. J. (Inst. Environ. Studies, Univ. Illinois, Urbana, IL 61801) **Activation of chemicals into mutagens by green plants: A preliminary discussion.** *Environ. Health Perspect.* 27: 45-50; 1978. (54 references)

A review is presented of studies which show that green plants can activate some chemicals (especially pesticides) into mutagens. *In vivo, in vitro,* and *in situ* plant assays of the *S*-triazine herbicides (atrazine, simazine, and cyanazine) are described. Both mitotic and meiotic damage has been documented. An assay using the waxy (wx) locus of *Zea*

mays is detailed. Studies on forward mutation, point mutation, and reversion have been carried out using this system.

79-1512. Ridgway, R. L. (Sci. & Educ. Adm., USDA, Beltsville, MD) **Pesticide use in agriculture.** *Environ. Health Perspect.* 27: 102-112; 1978. (46 references)

The use of pesticides in the United States, which has increased 40-fold in the last 30 yr, is reviewed. Advantages of pesticide use include reductions in loss due to pests, in labor required, and in soil erosion that is sometimes the results of mechanical means. Over 70% of all pesticide use is on cotton, corn, fruits and vegetables. The need for further testing on the mutagenicity of pesticides is pointed out. Benefit-cost analysis, as well as current pest control policy, are discussed. It is predicted that the quantities of pesticide use will continue to increase, but at a slower rate than in recent years.

79-1513. Odum, W. E.; Drifmeyer, J. E. (Dep. Environ. Sci., Univ. Virginia, Charlottesville, VA) **Sorption of pollutants by plant detritus: A review.** *Environ. Health Perspect.* 27: 133-137; 1978. (29 references)

The sorption of pollutants onto detritus particles derived from the decomposition of vascular plants is reviewed. Evidence is presented which indicates that environmental contaminants may be sorbed onto detritus particles at concentrations above ambient levels, thus creating a hazard for animals which consume detritus. Studies which show sorption of heavy metals, radionuclides, and pesticides onto detritus particles are described. One study indicated that, in a roadside marsh, lead from automobile exhaust reached levels as high as 1415 ppm on marshgrass detritus. Potential mechanisms which might explain detrital sorption are discussed.

79-1514. Keith, L. H.; Telliard, W. A. (Radian Corp., Austin, TX 78766) **Priority pollutants. I. A perspective view.** *Environ. Sci. Technol.* 13(4): 416-43; 1979. (2 references)

A court decision of June 7, 1978 of a case involving several environmental groups and the US EPA resulted in the adoption of the EPA Consent Decree to control the levels of pollutants in industrial wastewater discharges. The decree ensured that the earliest possible time for implementing effluent limitation laws would be enforced. A review of publicaly owned treatment works would also be required, as well as the examination of industrially owned facilities. The Toxic Pollutant List was formed to aid in the classification of harmful substances and it covered 65 general categories. The decree lacked allowance for time in solving analytical problems in testing for these substances in wastewaters, and so four criteria were adopted to help the EPA meet its obligations in regulating water pollutants. First, all compounds named on the Toxic Pollutant List should be considered as substances that should be quantified. Secondly, those compounds not found on the list should be tested if their frequency of occurrence exceeded or equaled 5%. Thirdly, all chemical production data should be reviewed where available. Lastly, all information on candidate compounds as pollutants of effluent waters should be tested for possible additions to the Toxic Pollutant List. The strategy developed by the EPA for testing of water for pollutants encompassed three basic phases: screening, verification, and monitoring. Problems that are as yet unresolved in the screening stage are discussed, along with automated software programs that are being adopted to spreed up the analysis processes. Future plans and first drafts for the implementation of the monitoring phase are considered, and a list of the 129 compounds on the Toxic Pollutant List is given.

79-1515. Street, M. L. (Dep. Agric. Biol., Univ. Newcastle, Newcastle, England) **The effects of juvenile hormone analogs on the eggs of *Pieris brassicae* L.** *Experientia* 34(4): 544-545; 1978. (11 references)

Eggs of the cabbage pest *Pieris brassicae* L. were treated topically with juvenile hormone analogs Ro-84314, Ro-69550, and Law's Mimic in acetone solution (10 μg/l acetone/20 eggs) at the time of oviposition or at 1, 2, or 3 days later. Control eggs were treated at the same time intervals with acetone, and the number of larvae that hatched from each group was counted daily until after ecdysis to the 4th instar stage. Mortality was almost 100% for all hormonal formulations when applied within 1 day after oviposition. Another large mortality period occurred at the ecdysis to the 2nd instar stage. Larvae that survived to the 2nd instar usually lived to become adults. Effective mortality 1 day after oviposition was also seen with Ro-84314 and Law's Mimic, but not with Ro-69550. When treatment occurred 2 or 3 days after oviposition, mortality dropped considerably, but was still higher than in control eggs. The mortality of *P. brassicae* due to treatment with juvenile hormone analogs was found in all stages of development, however the delayed mortality was explained in terms of an upset in the programming of the corpora allata, rather than the persistence of hormone analog residues.

79-1516. Wouters, W.; Van Den Bercken, J. (Inst. Vet. Pharmacol. & Toxicol., Univ. Utrecht, Utrecht, The Netherlands) **Action of pyrethroids.** *Gen. Pharmacol.* 9(6): 387-398; 1978. (88 references)

A review of the mode of action of the pyrethroid insecticides is given. The structural formulas of allethrin, bioresmethrin, permethrin, decamethrin, fenvalerate, and pyrethrin I show the common intact ester group which is responsible for most of the compounds activity. Allethrin has received much attention in pyrethroid studies. It is believed that allethrin acts on the sodium channels of the nerve membrane by slowing down the turning-off process of the increase in sodium conductance during excitation. No distinct relationship has been postulated between the effects of pyrethroids on membrane conductance and the insecticidal activity of these compounds. Studies have indicated that knockdown activity in locusts is probably related to the ability to stimulate repetitive activity in the sensory nervous sys-

tem. The insecticidal activity of pyrethroids seems to be related to molecular structure. Little is known about pyrethroid action in the higher animals and man. It is believed that in sufficient concentrations the pyrethroids might also have deleterious effects on the nervous systems of higher species.

79-1517. Dikshith, T. S. S. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **DDT - the problems of residue and hazard.** *J. Sci. Ind. Res.* 37(6): 316-328; 1978. (199 references)

Information on the important residue problems and hazards due to DDT accumulation in the environment are reviewed. It is estimated that about 10^8 kg of DDT are distributed in the biosphere, with atmospheric dust containing some of the highest levels of DDT residues. Among biological systems, freshwater fish, soil invertebrates, birds, and adipose tissues of man contain high amounts of DDT residues. The presence of DDT in food, water, and crops may be attributed to mishandling and abuse of this chemical. Surveys conducted in India have shown that DDT residues in foodstuffs are ubiquitous; 36 of 120 samples were found to contain levels of DDT of 8-83 ppm. Deleterious effects on wildlife include eggshell thinning, reduced reproductive efficiency in birds, and disappearance of several bird and fish species. Among mammals, high levels of DDT in brain, plasma, and fat can lead to CNS disorders and EEG changes. It is argued that a thorough evaluation of benefits of DDT vs. its hazards be made prior to banning its world wide use.

79-1518. Gunby, P. (Author address not given) **Dispute over some herbicides rages in wake of Agent Orange.** *J. Am. Med. Assoc.* 241(14): 1443-1444; 1979.

The EPA has ordered emergency suspension of the use of herbicides which contain 2,4,5-trichloro phenoxyacetic acid (2,4,5-T) esters. This suspension order was brought about due to evidence of a possible cause-effect relationship between spraying of forests with Agent Orange, and subsequent increased numbers of spontaneous abortions in the area. A major concern in agents containing these esters is that they also contain trace amounts of TCDD. Studies dealing with the aftermath of the use of these agents in Vietnam are still being conducted. Acute signs associated with exposure to these types of chemicals include skin irritation, nausea, respiratory difficulty, and dizziness. A computerized case study of persons exposed to the chemicals and of their spouses and offspring is being devised at the University of Illinois Medical Center in Chicago.

79-1519. Storherr, R. W. (Benefits & Field Stud. Div., US EPA, Washington, DC 20260) **Report on carbamate pesticides, fumigants and miscellaneous.** *J. Assoc. Off. Anal. Chem.* 62(2): 376; 1979. (2 references)

An update on the activities of one of the subcommittees of the Association of Official Analytical Chemists is given. Papers have recently been published on work with sodium monofluoroacetate, phosphine, and carbofuran. The recommendations for future work include a study toward an interlaboratory test of a residue method for carbamate insecticides, an expansion of the scope of the dinitrophenyl-ether derivative gas-liquid chromatographic method for residues of carbamate insecticides, and the continued study of analytical methods for the determination of carbofuran and its metabolites in foods. A study of the gas-liquid chromatographic method recommended for ethylene oxide, its chlorohydrin, and ethylene bromohydrin in foods is also planned. The scope of the official first action method of the gas-liquid chromatographic method for volatile fumigants in grain will be expanded, and collaborative testing methods for the determination of inorganic bromides in grains will be initiated. Research on interlaboratory methods for determining phosphine and sodium monofluoroacetate will also be continued. [At the 92nd annual meeting of the Association of Official Analytical Chemists.]

79-1520. Burke, J. A. (Div. Chem. & Phys., US FDA, Washington, DC 20204) **Report on organochlorine pesticides.** *J. Assoc. Off. Anal. Chem.* 62(2): 376-379; 1979. (19 references)

Reports on several organochlorine pesticides are given. Recommendations for further study on chlordane, dicofol, and toxaphene are given. Work on chlordane will be continued in the area of residue determination for *cis*-chlordane, *trans*-chlordane, octachlor epoxide (oxychlordane), and heptachlor epoxide in butter, poultry fat, and eggs. Studies will be conducted to improve the photolytic production of derivatives of heptachlor and heptachlor epoxide in the presence of certain problem food extracts, the applicability of extracts to selected foods, the utility of various photochemical sources, and the identification of derivatives. Reports will be presented on the determination of Kepone (chlordecone) dechlorination products in fish, oysters, and crustacea. Low moisture-high fat sample extraction procedures as well as multiresidue methods for organochlorine pesticides are also being researched. Methods for determining PCB residues in foods by gas chromatographic techniques have been approved as official first action procedures. Studies on extraction procedures for root absorbed residues are being continued on dieldrin in potatoes. Studies have successfully shown that the method for tetradifon, endosulfan I, II, and sulfate, and tetrasul is valid for all nonfatty foods. [At the 92nd annual meeting of the Association of Official Analytical Chemists.]

79-1521. Newsome, W. H. (Food Res. Div., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ont. K1A OL2, Canada) **Report on fungicides, herbicides, and plant growth regulators.** *J. Assoc. Off. Anal. Chem.* 62(2): 379-380; 1979. (2 references)

The recommendation of organotin fungicides for further study and reports on other fungicides, herbicides and plant growth regulators are given. Analytical techniques for chlorophenoxy alkyl acids, diquat and paraquat, dithiocarbamates, sodium trichloroacetate, succinic acid, 2,2-dimethylhydrazide, carbamate herbicides, chloramben, chlorthalonil,

dichlobenil, dinitro compounds, diphenamid, and picloram are mentioned as needing further study. The official first action status for the gas-liquid chromatogaphic method for ethylene thiourea will be continued. An HPLC technique for the determination of naphthalene acetic acid in apples has been developed, and work is being continued on a method for naphthalene acetamide. The method proposed for substituted ureas involving gas-liquid chromatographic determination of iodinated anilines formed after hydroilysis, distillation, and diazothization is now ready to undergo collaborative study. A method for *s*-triazines is being developed utilizing gas-liquid chromatography with electrolytic conductivity detection and may be used for atrazine and cyanazine in corn and potatoes at residues of 0.1 ppm or greater. No reports have been received as yet on the topics of benzimadazole type fungicides, dalapon, dichloran, sodium *o*-phenylphenate, thiocarbamate herbicides, or trifluralin. [At the 92nd annual meeting of the Association of Official Analytical Chemists.]

79-1522. McCully, L. A. (Health Prot. Branch, Health & Welfare Canada, Ottawa, Ont. K1A 1B7, Canada) **Report on organophosphorus pesticides.** *J. Assoc. Off. Anal. Chem.* 62(2): 383-387; 1979. (43 references)

Various reports on organophosphorus pesticide residue analysis techniques are presented in a brief summary. A method for ethoprop residues by gas-liquid chromatography (GLC) with flame photometric detection is described. Residue methodology using GLC for fenamiphos and fensulfothion in tobacco is also given. A polarographic technique for phosmet in apples is reported. A technique to simultaneously determine residues of vamidothion, its sulfoxide, and its sulfone in tobacco has been developed. A GLC method applicable to 40 organophosphorus pesticide residues in plant material is described. Other GLC techniques are described for the determination of organophosphorus compounds in such substrates as Chinese cabbage, foods, organic soils, and other fruits and vegetables are given. Confirmation procedures are discussed for various pesticide residues in water. Results of studies involving the sweep codistillation technique are reported. Specific reports are still needed on such topics as chlorine-containing organophosphorus pesticides, extraction procedures, soil, and water. [At the 92nd annual meeting of the Association of Official Analytical Chemists.]

79-1523. Bontoyan, W. R. (Off. Pestic. Programs, US EPA, Beltsville, MD 20705) **Report on the twenty-second annual meeting of the Collaborative International Pesticides Analytical Council (CIPAC).** *J. Assoc. Off. Anal. Chem.* 62(2): 431-432; 1979. (4 references)

An official CIPAC membership list is given and changes in the status of some of the methods for pesticide residue analysis that were adopted at the meeting of the CIPAC are reported. Compounds whose proposed methods were adopted for full status methods included 2,4-D + picloram, malathion, copper (water-soluble copper in water-insoluble copper fungicides), tetradifon, fluometuron, d-*trans* allethrin, dinobuton, benzoylprop-ethyl, and isomalathion. Some compounds whose analysis methods were adopted as provisional CIPAC methods were parathion, petroleum oils (for determination of oil content of emulsifiable pesticide concentrates), bromacil, dithianon, oxydemeton-methyl, and dinoterb. Other compound methods were mentioned by their CIPAC code numbers.

79-1524. Cookson, C. (Author address not given) **'Emergency' ban on 2,4,5-T herbicide in US.** *Nature (London)* 278(5700): 108-109; 1979.

The US EPA has taken action to impose an emergency suspension of the use of 2,4,5-T due to results of an Oregon study suggesting that a higher incidence of miscarriage is found in areas where this herbicide is used. Use of the herbicide may continue in isolated range areas and on rice fields. The ban will also take into account the discontinuance of the use of silvex, a compound very similar to 2,4,5-T. The contaminant of these herbicides, TCDD, has been shown to cause miscarriages and tumors in animals even at very low concentrations. The economic impact of the ban is estimated to be light, as alternative herbicides may be used, except in the forestry industry where a long-term projection predicts that a 7 to 12 million loss could be realized from the necessity of using more expensive herbicides that are also less efficient. At the present, Dow Chemical is the leading manufacturer of silvex. Companies will have the opportunity to appeal the ban on the use of 2,4,5-T and silvex at hearings, and long term studies will determine if the herbicides should be banned permanently from use.

79-1525. Hay, A. (Author address not given) **Dioxin: the 10-year battle that began with Agent Orange.** *Nature (London)* 278(5700): 108-109; 1979.

When the herbicide 2,4,5-T was found to contain the highly toxic contaminant, TCDD in the late 1960's, concern over its use began to mount. The EPA invited interested parties to submit cases for and against the use of 2,4,5-T, which had already been banned from use in some foreign countries. Most of the responses came from environmental groups and major manufacturing companies. Dow Chemical company supplied most of the 2,4,5-T that was used in defoliation programs during the Vietman War in the form of a compound known as Agent Orange. In 1969, Agent Orange was reported to be teratogenic because of its contaminant TCDD which was present in amounts in excess of 30 ppm. The EPA made allowances to agree to the use of 2,4,5-T with a TCDD contamination level of less than 0.1 ppm, but later these provision were revoked as new data from experiments was received. Dow Chemical was angered by opposition from environmental groups because the company believes that evidence for 2,4,5-T's safety should be based on science and not on emotions. The case of a Vietman veteran who allegedly died from contracting cancer of the colon from his exposure to 2,4,5-T as a sprayer during the war is presented. The US manufacturing companies of the herbicide are being sued by the estate of this man. Other servicemen have claimed that exposure to 2,4,5-T has damaged their health. The Environmental De-

fense Fund has suggested that the very presence of dioxin in 2,4,5-T renders this herbicide dangerous, and advocates the ban of its use.

79-1526. Crow, K. (Princess Margaret Hosp., Swindon, England) **Chloracne: the chemical disease.** *New Sci* 78(1098): 78-80; 1978.

Chloracne is a relatively harmless skin disease caused by contact with certain aromatic chlorinated hydrocarbons. However, the fact that such an exposure to a potentially toxic chemical has taken place could point to warnings of covert damages. Chloracne seems to have a predilection for the skin of the face but involvement also occurs with the neck, shoulders, genitalia, chest, and lower trunk in this order. In severe cases the arms and legs are involved. Chlornaphthalenes, PCBs, polychlorinated dibenzofurans, polychlorinated dibenzodioxins, tetrachloroazobenzenes, and tetrachlorazoxybenzenes are the compounds known to produce chloracne in humans, with the acneigenic potential of each compound being related to its overall toxicity. The number of chlorines in the molecule has been shown to determine the toxicity of the compond. The dioxins (especially TCDD) with 4 chlorines have been proven to be great inducers of chloracne. Many toxic chemicals will initiate the steps needed to undergo detoxification by the induction of certain cellular enzymes. Chemical structures and steric effects have also been shown to affect the toxicity of the chlorinated compounds. Many of the chlorinated aromatic hydrocarbons have been proven to be teratogenic and fetotoxic in animals and in humans. Data on the long term effects of chloracneigens are limited to animal studies. There is little hazard of contamination of commercial products with chloracneigens. The only real risk of exposure to these compounds is in industry where steps are being taken to control the occupational hazards involved with handling these substances.

79-1527. Freed, V. H.; Schmedding, D.; Kohnert, R.; Haque, R. (Dep. Agric. Chem. Oregon State Univ., Corvallis, OR 97331) **Physical chemical properties of several organophosphates: some implication in environmental and biological behavior.** *Pestic. Biochem. Physiol.* 10(2): 203-211; 1979. (12 references)

Physical properties such as molecular weight, melting point, boiling point, solubility in water, and vapor pressure are given for some organophosphates including dichlofenthion, ronnel, methyl chlorpyrifos, chlorpyrifos, leptophos, fenitrothion, dicapthon, methyl parathion, parathion, malathion, mevinphos, phosmet, phosalone, and dialifor. Hydrolysis rates and results of protein binding experiments are also listed for organophosphate compounds. The suprisingly high partition coefficients for certain organophosphates suggests the possibility of their uptake by organisms along with a chance for storage with the longer persistence which would accompany that factor.

79-1528. Zamphir, Gh.; Mihail, G. (Inst. Hyg. & Public Health, Jassy, Romania) **Problems de sante publique poses par l'emploi des pesticides en agriculture. [Public health problems arising from the use of pesticides in agriculture.]** *Sante Publique (Bucharest)* 21(1-2): 63-70; 1978. (48 references) (French)

Pollution of the environment with organophosphorus and chlorinated organic compounds used as pesticides in agriculture has multiple, complex and long-lasting consequences in the form of toxic effects on human beings, aquatic and teluric flora and fauna, their accumulation in the body, and their mutagenic, teratogenic and carcinogenic effect. While organophosphorus compounds cause especially acute accidents, organochlorine pesticides, which are more persistent, accumulate in the food chain and in fatty tissues of humans especially from fish consumption. Therefore, the study of the persistence of pesticides, their cycle in the environment and animal and human organism, their detection, control of their use with the view of protecting the environment, and the relationship between pesticide concentration in body tissues and health effects must be identified.

79-1529. Diaz-colon, J. D.; Bovey, R. W. (Fed. Res. Sci. Educ. Adm., USDA, Collage Station, TX) **Selected bibliography of the phenoxy herbicides. V. Interrelations with microorganisms.** *Tex. Agric. Exp. Stn. Misc. Publ.* 87 p.; 1978. (510 references)

A selected bibliography relating to the phenoxy herbicides effects on microorganisms and the microorganisms interactions with the herbicides is presented in two parts. The bibliography of each part is organized alphabetically by primary author and is preceded by a subject index in which the phenoxy herbicide appears as the primary term, and the various forms of microorganisms (fungi, bacteria, algae, protozoa, viruses, and unidentified groups) constitute the secondary terms. Scientific names or common names of the various microorganisms appear alphabetically as tertiary terms under the above mentioned headings and the pertinent number references corresonding to the bibliographic reference that can be found at the end of the index is given directly across from each tertiary term.

79-1530. Natl. Res. Counc., Washington, DC **Kepone/ mirex/ hexachlorocyclopentadiene: an environmental assessment.** *US NTIS PB Rep.* PB-280,289: 84 pp.; 1978. (100 references)

This report's assessment of the scientific and technical knowledge about the effects of Kepone (chlordecone), mirex, and hexachlorocyclopentadiene as environmental pollutants is based primarily on two literature surveys prepared for EPA's Office of Research and Development by Battele Columbus Laboratories and the Stanford Research Institute. The principal findings and research needs arising from the panel's assessment are summarized. Documentation for the findings can be found in the body of the report as noted parenthetically after each finding. The list of research needs identifies areas where more knowledge is needed before a truly comprehensive assessment of the effects of Kepone,

mirex, and hexachlorocyclopentadiene can be made. (Author abstract by permission)

79-1531. Hansen, D. J. (Environ. Res. Lab., US EPA, Gulf Breeze, FL) **Impact of pesticides on the marine environment.** *US NTIS PB Rep.* PB-285,923: 176 pp.; 1978. (89 references)

This symposium was conducted under a US-USSR Environmental Agreement, Project 02.06-21 titled "Influence of Pollutants on Marine Organisms." American and Soviet specialists discuss state-of-the-art for hydrobiological analysis of basic structural components of marine ecosystems and the influence of various pollutants on these components. Participants define problems related to methods for modeling the influence of pollutants on the marine environment, long-term forecasting and determination of permissible loads of pollutants, and the unification and intercalibration of methods for determining production of microorganisms of ocean bacterioplankton and phytoplankton. Results or laboratory research on the influence of pollution on the marine environment are presented. Proceedings were published in English and Russian in compliance with the Memorandum from the 4th Session of the Joint US-USSR Committee on Cooperation in the Field of Environmental Research. (Author abstract by permission)

79-1532. Jurkovicova, M.; Van Touw, J. H.; Sussenbach, J. B.; Ter Schegget, J. (Lab. Virol., State Agric. Univ., Wageningen, The Netherlands) **Characteriziation of the nuclear polyhedrosis virus DNA of *Adoxophyes orana* and of *Barathra brassicae*.** *Virology* 93(1): 8-19; 1979. (42 references)

Before biological agents are used as alternate methods to chemical pesticides for insect control, the possible hazards which might arise from the biochemical and biophysical properties of these agents need to be studied. Entomopathogenic biocontrol agents for Lepidoptera, such as the nuclear polyhedrosis viruses of *Adoxophyses orana* and *Barathra brassicae* have been examined to characterize and compare their genetic material. The viruses were isolated and their molecular weights were determined by electron microscopy and renaturation kinetics analysis. The molecular weight of *A. orana* virus was less than that of the *B. brassicae* virus, and neither of the genomes contained repetitive sequences. Competition hybridization analysis of the two viruses showed the absence of homology between them. DNA analysis with restriction endonucleases also showed that the two viruses are different. *A. orana* and *B. brassicae* polyhedrosis viruses also differed in G + C content which was confirmed by buoyant density data.

79-1533. Cumming, R. B. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Mutagenicity and water chlorination: prospect and perspective.** In: *Water Chlorination: Environmental Impact and Health Effects.* Jolly, R. L., *Ed. (Ann Arbor: Ann Arbor Science)* 2(chapter 31): 411-416; 1977. (6 references)

A brief overview of mutagenicity and mutagenicity testing is given in this paper which serves to introduce three papers dealing with compounds, including pesticides, that can be found in drinking water and are suspected of having mutagenic properties. The use of mutagenicity model studies to evaluate the potential genetic hazard which may be present in the use of chlorinated water is discussed. The studies as they are currently carried out provide a measurable end point and allow some positive action to be taken regarding mutagens present in the water treatment process or in the environment at large. The possible relationship between mutagenesis and carcinogenesis is explored.

79-1534. Lum, J. (Effluent Guidelines Div., US EPA, Washington, DC 20460) **Status of regulation development for cooling water discharges from power plants.** In: *Water Chlorination: Environmental Impact and Health Effects.* Jolley, R. L., *Ed. (Ann Arbor: Ann Arbor Science)* 2(Chapter 64): 823-829; 1977.

The effluent limitations guidelines for the steam electric power industry are undergoing re-evaluation. One hundred twenty-nine specific compounds are being examined, many of which are chlorinated organics. The EPA will examine the concentration of these pollutants currently in power plant effluents, manners in which these concentrations can be lowered, what the cost of lowering the concentration of pollutants would be to the industry, and any other impact of lowering these pollutants or of allowing the pollution to continue unregulated. Data presently available indicate that the discharge or organics from such plants is not handled as efficiently as it might be. Technologies which could improve the situation are being reviewed. On the list of priority compounds to be monitored and reduced from the effluents are pesticides and their metabolites with special attention given to DDT, endosulfan, endrin, heptachlor, hexachlorocyclohexane (BHC) and PCBs and their metabolites.

79-1535. Makeeva-Gur'yanova, L. T.; Spiridonov, Yu. Ya.; Klimenko, A. A.; Bondarev, V. S.; Matveev, Yu. M. (All-Union Res. Inst. Phytopathol., Primorsk, USSR) **Adsorbsiya piklorama pochvami razlichnykh tipov. [Adsorption of picloram by different soil types.]** *Agrokhimiya* 3(8): 130-138; 1978. (9 references) (Russian)

The comparative adsorbtion of picloram by various soils of the European part of the Soviet Union, and factors affecting the degree of picloram adsorbtion were examined. *In vitro* incubation of soil samples with chemically pure active ingredient showed that the coefficient of adsorption of picloram ranged from 0.07 μg/kg for the soddy-podzolic soil to 3.74 μg/kg for the red soil. It was found that adsorption of picloram depended upon the humus level. An increase in the humus level from 2.16% to 5.36% caused an almost ten-fold increase in the adsorption coefficient for picloram.

79-1536. Anonymous **Residus des medicaments veterinaires dans les denrees d'origine animale. [Residues of veterinary drugs in animal foods.]** *Ann. Pharm. Fr.* 36(9-10): 499-504; 1978. (French)

The tolerance (maximum permissible concentration of a drug in an animal food product); waiting time (time between last administration and slaughter) for different modes of drug administration and interdiction of administration of a drug to certain types of animals or during certain times or conditions are given for antibiotics, antiparasitic drugs (cambendazole, toxaphene, dichlorovos, lindane, mebendazole, nitroxonile, oxyclosanide, parbendazole, tetramisole, thiabendazole), trace elements (arsenic, selenium), tranquilizers (Xylazine), and hormones (trenbolone acetate, cloprostenol, diethylstilbestrol, diensestrol, hexestrol, estradiol, norgestomet.

79-1537. Baba, H.; Kuwano, K.; Kawaguchi, Y.; Asada, Y. (Sect. Sanit. Chem., Nagasaki Prefect. Inst. Public Health & Environ. Sci., Nagasaki 852, Japan) **[Pesticide residues in foods (report No. 8).]** *Annu. Rep. Nagasaki Prefect. Inst. Public Health & Environ. Sci.* 17(17): 101-102; 1977. (Japanese)

Results of pesticide residue determinations in foods in 1977 are reported. The specimens sampled included strawberries, peaches, lettuce, rye, grapes, cucumbers, tomatoes, pimentoes, ginger, onions, potatoes, and cow's milk. Pesticides detected included endrin, captafol, chlorobenzile, chlorfenvinphos, dicofol, captan, organophosphorus compounds, and carbaryl. In potatoes, DDT and dieldrin were detected at 0.003 and 0.001 ppm, respectively. The concentration of BHC was very low, ranging from 0.007-0.001 ppm, except in one samples, where residues of 0.010 ppm were detected. β-BHC (average of 0.005 ppm), DDT (average of 0.001 ppm), and dieldrin (average of 0.001 ppm) were detected in all specimens of cow milk. These values were unchanged from those detected in other years. None of the residue levels exceeded the acceptable concentrations for these pesticides.

79-1538. Daughton, C. D.; Cook, A. M.; Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Phosphate and soil binding: factors limiting bacterial degradation of ionic phosphorus-containing pesticide metabolites.** *Appl. Environ. Microbiol.* 37(3): 605-609; 1979. (17 references)

Soils that had a high binding capacity for inorganic orthophosphate (P*i*) had reduced capacities to bind ionic alkyl phosphorus compounds. Only ionic methylphosphonate (MPn) and ionic phenylphosphonate exhibited moderate binding. *Pseudomonas testosteroni* used either MPn or P*i* as a sole phosphorus source and exhibited diauxic utilization of MPn and P*i*. The utilizaiton of PMn was suppressed in the presence of P*i*. This suppression was abolished by a P*i*-binding soil. The soil did not have a significant effect on the maximum rate of degradation of either MPn or the poorly bound ionic *O*-isopropyl methylphosphonate, whereas the amount of MPn (but not the amount of *O*-isopropyl methylphosphonate) metabolized was reduced in the presence of soil. (Author abstract by permission)

79-1539. DiGeronimo, M. J.; Nikaido, M.; Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Utilization of chlorobenzoates by microbial populations in sewage.** *Appl. Environ. Microbiol.* 37(3): 619-625; 1979. (19 references)

Microorganisms in sewage decomposed 3,4-dichlorobenzoate and *m*-, *p*-, and *o*-chlorobenzoates. As the substrate disappeared, populations capable of growing on these compounds proliferated. Neither 2,4-dichlorobenzoate nor 2,3,6-trichlorobenzoate was destroyed by the sewage microflora. The addition of glucose or benzoate and *m*-chlorobenzoate to the sewage did not promote degradation of 2,4-di- or 2,3,6-trichlorobenzoates. The populations responsible for the biodegradation of the chlorinated compounds were initially less than 100 cells/ml. During the metabolism of *m*-chlorbenzoate, 5-chlorosalicylate and 4-chlorocatechol were formed. (Author abstract by permission)

79-1540. Gaskin, D. E.; Holdrinet, M.; Frank, R. (Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, Ont. N1G 2W1, Canada) **Organochlorine residues in shearwaters from the approaches to the Bay of Fundy, Canada.** *Arch. Environ. Contam. Toxicol.* 7(4): 505-513; 1978. (14 references)

Organochlorine residues were sought in 26 specimens of Greater Shearwater (*Puffinus gravis*) and Sooty Shearwater (*P. griseus*) collected in August, 1974 from the southeastern approaches to the Bay of Fundy. Residue levels of DDTs, PCBs, dieldrin, oxychlordane, mirex and HCB (hexachlorobenzene) in depot fat, liver, and muscle are reported. HCB was present at the same order of magnitude in both species; all other contaminants were signficantly higher in *P. gravis* than in *P. griseus*. Levels of all compounds except mirex and HCB were higher in the depot fat of female *P. gravis* than in males. (Author abstract by permission)

79-1541. Seiber, J. N.; Winterlin, W. L.; McChesney, M. M. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Residues of toxaphene, DEF, and paraquat in plant**

parts and gin waste from a treated cotton field. *Arch. Environ. Contam. Toxicol.* 8(2): 125-137; 1979. (14 references)

The origin and fate of the gin waste residues of three chemicals- toxaphene, DEF, and paraquat-used frequently in cotton production in California were studied. Residues were determined for foliage and bolls in the live plants, for lint and seed in harvested seed cotton, and for gin waste and its lint and non-lint components, following commercial treatments to the cotton crop. Gin waste residues were followed during five months of open storage to ascertain dissipation rates in a typical waste samples. Relatively high residues of each of the three chemicals persisted at harvest, during storage prior to ginning, and in stored gin waste. The major proportion of gin waste residue was associated with the non-lint components-leaf parts, burrs, stems and other foreign matter. Average stored gin waste residues in the lint and non-lint components were 13 and 60, 11 and 58, and 5 and 10 ppm for toxaphene, DEF, and paraquat, respectively, during the open storage period. (Author abstract by permission)

79-1542. Perry, J. A. (Div. Environ., Idaho Dep. Health & Welfare, Pocatello, ID 83201) **Pesticide and PCB residues in the upper Snake River ecosystem, Southeastern Idaho, following the collapse of the Teton Dam 1976.** *Arch. Environ. Contam. Toxicol.* 8(2): 139-159; 1979. (12 references)

The Teton Dam in Southeastern Idaho collapsed on June 5, 1976. The resulting flood damaged a large area and caused the release of toxicants into the Snake River. A pesticide recovery team in a helicopter worked the flooded area for three wk and collected 1,104 containers, about 35% of which contained toxicants. It was estimated that less than 60% of the lost pesticide containers were recovered. This paper addresses the results of a one-time sampling effort designed to determine the magnitude of the chemical contamination. Over 300 samples of fish, plankton, waterfowl, sediments, water, stream, drift, aquatic plants, and soil were taken. Pesticide residues were measured as μg/kg (ppb) wet weight, whole animal basis. Rainbow trout had as much as 1432 μg/kg total DDT plus analogs, 66 μg/kg dieldrin, and 1010 μg/kg PCBs. Utah suckers had up to 1420 μg/kg total DDT plus analogs, 32 μg/kg total DDT and analogs, 30 μg/kg dieldrin and 1400 μg/kg PCBs. These PCB and DDT levels were high, approaching the 2,000 μg/kg FDA proposed tolerance, but were below the 5,000 μg/kg present tolerance. Dieldrin levels were low and organophosphates were undetectable. An undeveloped area (the Fort Hall Bottoms) showed higher levels of contaminants than did an industrialized area (the lower Portneuf River). This apparent discrepancy remains unexplained. Very little pre-flood data on a whole fish basis were available for comparison. However, it does not appear that any human health hazard due to pesticide levels exists in this portion of the Snake River. (Author abstract by permission)

79-1543. Sarkka, J. (Dep. Biol., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Mercury and chlorinated hydrocarbons in zoobenthos of Lake Paijanne, Finland.** *Arch. Environ. Contam. Toxicol.* 8(2): 161-173; 1979. (36 references)

The average amounts of mercury, PCBs, and Σ DDT (primarily DDE), found in macrozoobenthos, on the wet basis, in Lake Paijanne, Finland, for the time period 1972-1974, were 79 ng/g, 29 ng/g, and 8 ng/g, respectively. Lindane was found in negligible amounts in only 2% of the samples examined; aldrin was present in 10% of the samples; no dieldrin was detected. Mercury and PCB concentrations varied regionally in the lake. PCB and Σ DDT concentrations were greater in the predatory bottom animals than in the herbivores or detritus feeders, and the amounts of chlorinated hydrocarbons were greater in profundal animals than in littoral animals. No significant correlation was apparent between the amount of residues found and the weight of the animals (e.g. *Anodonta*). A significant positive correlation was evident in the amounts of PCBs and Σ DDT in most of the taxonomical groups. *Spongilla lacustris* and *Anodonta piscinalis* were excellent species for monitoring purposes. (Author abstract by permission)

79-1544. Kveseth, N. J.; Bjerk, J. E.; Fimreite, N.; Stenersen, J. (Dep. Pharmacol. & Toxicol., Vet. Coll. Norway, Oslo, Norway) **Residues of DDT in a Norwegian fruitgrowing district two and four years after the termination of DDT usage.** *Arch. Environ. Contam. Toxicol.* 8(2): 201-212; 1979. (36 references)

This study describes the extent of DDT contamination in a typical fruit growing district in Norway two and four yr after the DDT ban. Residues of DDT in man, dairy cows and soil were about five to one hundred times higher than in the control groups, while residues found in samples from the marine biota were the same or moderately higher. The residues of DDT in cows, gulls and parts of the marine samples showed a significant decrease from 1972 to 1974, while the level in soil was almost constant. The amount of DDE had increased considerably in 1974 for all the species except for the gull, although not to the same degree. The distribution of DDE, DDD (TDE), and DDT in soil were almost constant during the two yr of sampling. (Author abstract by permission)

79-1545. Clark, J. M.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **Metabolism of toxaphene by aquatic sediment and a camphor-degrading pseudomonad.** *Arch. Environ. Contam. Toxicol.* 8(3): 285-298; 1979. (20 references)

The metabolism of ^{14}C- and ^{36}Cl-labeled toxaphene (a complex insecticidal mixture of polychlorobornanes, C10H18-*N*Cl*N*, where $N = 6$ to 10) has been studied under aerobic and anaerobic incubation conditions in aquatic sediments, enriched bacterial and washed cell cultures of *Pseudomonas putida*. An analysis of the production of water soluble metabolites as the major indicator of metabolism, showed that the aerobic route of toxaphene degradation was significant in all incubation conditions, and demonstrated that oxidative metabolism was important in the degradation

of toxaphene. The absence of degradative activities in sediment which had been autoclaved prior to incubation and the appearance of metabolites formed during sediment incubation of pure toxicants A, B and C were taken as indicators of metabolism of toxaphene by microorganisms in sediment. (Author abstract by permission)

79-1546. Klaassen, H. E.; Kadoum, A. M. (Div. Biol., Dep. Entomol., Kansas State Univ., Manhattan, KS 66506) **Distribution and retention of atrazine and carbofuran in farm pond ecosystems.** *Arch. Environ. Contam. Toxicol.* 8(3): 345-353; 1979. (4 references)

The distribution and retention of atrazine and carbofuran in farm ponds were examined after application of 0.3 ppm of atrazine [2-chloro-4- (ethylamino)-6-(isopropylamino)-*S*-triazine] for two yr and 0.025 ppm of carbofuran (2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate) the first yr and 0.050 ppm for the second yr. Samples of water, mud, and various biological components for the systems were collected periodically for residue analyses by gas chromatogrpahy. Soon after atrazine was applied, it was found in all physical and biological components. No biological magnification was observed. Carbofuran showed up only in the water and mud immediately after application; from then on it was absent from all components. No adverse effects from either pesticide were observed in the biological components. (Author abstract by permission)

79-1547. Nigg, H. N. (Inst. Food & Agric. Sci., Agric. Res. & Educ. Cent., Univ. Florida, Lake Alfred, FL 33850) **Comparison of pesticide and particulate recoveries with the vacuum and dislodgeable surface pesticide residue techniques.** *Arch. Environ. Contam. Toxicol.* 8(3): 369-381; 1979. (25 references)

The dislodgeable and vacuum surface residue techniques were compared for the quantity of pesticide residue and quantity and quality of particulate matter removed from 'Valencia' orange leaves. Data trends for dislodgeable and vacuum parathion and paraoxon residues were correlated at $r \geq 0.95$ for both emulsifiable concentrate and wettable powder formulations. The amount of pesticide residue and particulate matter obtained was dislodgeable > glass fiber filter > 5.0 μ filter > 0.8 μ filter. The flow rate of the filter was correlated with the amount of residue removed. The quality of particulate matter as judged by size analyses was equal. The dislodgeable technique removed about five times more particulate material and about eleven times more pesticide residue compared to the vacuum technique. (Author abstract by permission)

79-1548. Palermo, D.; Lo Muzio, F.; Gentile, G. (Ist. Zooprofil. Sper. Puglia Basilicata, Foggia, Italy) **Residui di pesticidi clororganici nelle carni degli equini allevati a Foggia. [Residues of organochlorine pesticides in horse meat from Foggia, Italy.]** *Arch. Vet. Ital.* 29(3-4): 69-70; 1978. (5 references) (Italian)

Meat from horses raised in the province of Foggia, Italy was examined for residues of organochlorine pesticides. Detection in 100% of the 23 samples was confirmed for DDT, DDE, and lindane. Dieldrin was found in 86.4% of the samples, and aldrin was detected in 63.6% of the specimens. Concentrations of each compound were below the tolerance levels established by the US Food and Drug Administration.

79-1549. Singhal, J. P.; Khan, S.; Bansal, O. P. (Chem. Lab., Fac. Eng. & Technol., Aligarh Muslim Univ., Aligarh, India) **Adsorption of oxamyl on montmorillonites.** *Aust. J. Chem.* 31: 2151-2156; 1978. (14 references)

The mechanism of adsorption and interaction of oxamyl with acid and base-saturated montmorillonites in dilute claywater suspensions was investigated. In this study, bentonite, obtained from Akli, in India, was purified by sedimentation and centrifugation. Calcium-saturated montmorillonite, the main constitutent of this bentonite, was prepared by an ion-exchange technique. The concentrations of all the suspensions varied from 14 to 15.2 g/l. Adsorption experiments were conducted by taking 10 ml of the appropriate montmorillonite suspensions in a large number of glass tubes, adding amounts of standard oxamyl solution, making up the volumes to 25 ml with distilled water, and shaking for 30 hr. The adsorption of oxamyl by montmorillonites was found to increase with time up to an interval of 30 hr after which it became constant. The adsorption reaction was found to be a first order reaction. The half-life period of adsorption of the pesticide increased with an increase in its concentrations which suggested a reduction in the rate of reaction with a rise in concentration of oxamyl.

79-1550. Schoor, W. P. (Environ. Res. Lab., US EPA, Gulf Breeze, FL) **Distribution of mirex in an experimental estuarine ecosystem.** *Bull. Environ. Contam. Toxicol.* 21(3): 315-321; 1979. (12 references)

The movement and accumulation of mirex was studied in an experimental estuarine ecosystem designed to represent the natural environment. Aquaria containing artificial seawater, beach sand, turtle grass plants and adult grass shrimp were set up. Mirex was introduced by air-lift columns, in which water swept over mirex bait is flushed into the aquaria by air introduced into the bottom of the columns. A gas chromatograph with an electron capture detector was used for determination of mirex. The mirex concentration in the water ranged from 0.12 μg/kg on day 1 to 0.018 μg/kg on day 13. The only living component in which the mirex concentration increased was the hepatopancreas of the grass shrimp, which showed mirex concentrations of 280 μg/kg on day 1 and 650 μg/kg on day 13. Both turtle grass and sand had low levels of mirex. However, the linear increase in the amount of mirex in the sand indicates that it may be a reservoir.

79-1551. Ramakrishna, C.; Gowda, T. K. S.; Sethunathan,

N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack 753006, India) **Effect of benomyl and its hydrolysis products, MBC and AB, on nitrification in a flooded soil.** *Bull. Environ. Contam. Toxicol.* 21(3): 328-333; 1979. (15 references)

Studies were carried out on the effects of the systemic fungicide benomyl (methyl-1- (butyl-carbamoyl)-2- benzimidazole carbamate) and its hydrolysis products methyl-2-benzimidazole carbamate (MBC) and 2-aminobenzimidazole (AB) on nitrification. Benomyl, MBC and AB were incorporated into 10 g soil samples at the rates of 10, 100 or 1000 ppm, along with 500 ppm ammonium sulfate, and the soils were then flooded. At the 1000 ppm level, nitrification was drastically inhibited by benomyl and slightly retarded by MBC. Concentrations of 100 or 1000 ppm AB inhibited nitrification. In tests in which benomyl was added to cultures of nitrifying bacteria, the oxidation of ammonia was inhibited by a concentration of 10 ppm. MBC had virtually no effect on the bacterial cultures, while 100 ppm AB caused inhibition of nitrification. It is suggested that knowledge of the inhibitory effect of benomyl may be helpful in preventing nitrogen loss from flooded soils.

79-1552. Mes, J.; Davies, D. J. (Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario, Canada) **Presence of polychlorinated biphenyl and organochlorine pesticide residues and the absence of polychlorinated terphenyls in Canadian human milk supplies.** *Bull. Environ. Contam. Toxicol.* 21(3): 381-387; 1979. (14 references)

A nationwide study was carried out in Canada to determine the levels of polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCT), and organochlorine (OC) pesticides in human milk. One hundred samples were analyzed by gas chromatography. Average values of the ten compounds tested ranged from 1 ng/g heptachlor expoxide, oxychlordane and *trans*-nonachlor to 35 ng/g for *p,p'*-DDE. Maximum values observed ranged from 2 ng/g for oxychlordane and *trans*-nonachlor, to 144 ng/g for *p,p'*-DDE. 100% of all samples had residues of *p,p'*-DDE and *p,p'*-DDT greater than 1 ng/g. Comparison to previous studies showed that heptachlor epoxide, *p,p'*-DDE, dieldrin, *o,p'*-DDT and *p,p'*-DDT have all decreased in the previous 8-yr period.

79-1553. Young, D. R.; Heesen, T. C.; Esra, G. N.; Howard, E. B. (South. California Coastal Water Res. Proj., El Segundo, CA 90245) **DDE-contaminated fish off Los Angeles are suspected cause in deaths of captive marine birds.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 584-590; 1979. (12 references)

The deaths of several species of Los Angeles Zoo birds were investigated to determine the relationship of contamination by DDT to the mass mortality of the collection which occurred in 1976. Frozen tissue specimens from the birds in question were analyzed by electron capture gas chromatography. Similar determinations were done on two wild pelicans that had died accidentally by strangulation in fish lines. Tissue analysis of whole fish from two different lots that had been fed to the zoo birds were also performed. Results showed that brain and liver tissue of the zoo birds contained levels of DDT which were 2 orders of magnitude above those found in the wild birds. *p,p'*-DDE constituted over 90% of the total DDT residues. The level of this isomer in queenfish was greater than dietary levels shown to be lethal to kestrel in a previous experiment. These findings strongly suggest that DDT contamination via diet was the cause of death to these captive cormorants and gulls.

79-1554. Rosales, M. T. L.; Botello, A. V.; Bravo, H.; Mandelli, E. F. (Cent. Cienc. Mar. & Limnol., Univ. Nac. Autonoma Mexico, Villa Obregon, Mexico) **PCBs and organochlorine insecticides in oysters from coastal lagoons of the Gulf of Mexico, Mexico.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 652-656; 1979. (6 references)

Oysters of the species *Crassostrea virginica* were collected during July and August, 1976, off of the Mexican coast of the Gulf of Mexico to be analyzed for their residue content of organochlorine pesticides and PCB. Soft tissue of the specimens was homogenized and extracted with iso-octane and cleaned up by column chromatography to be analyzed by gas chromatography. PCB's were found in all samples analyzed and ranged from 14 to 90 ppb. DDT and its analogs were found in most oysters and ranged in concentration from 6 to 28 ppb. Dieldrin was also common in most samples and ranged in concentration from 0.03 to 1.1 ppb. Areas affected by agricultural practices displayed the highest dieldrin and DDT levels. γ-Chlordane and β-endosulfan were also detected in oysters at some of the sampling sites. This study indicates that the levels of organochlorine compounds in oysters of the Mexican coastal lagoons were comparatively low even though there is no restriction on the use of these substances as pesticides in Mexico.

79-1555. Quirke, J. M. E.; Marei, A. S. M.; Eglinton, G. (Organ. Geochem. Unit, Sch. Chem., Univ. Bristol, Bristol BS8 1TS, England) **The degradation of DDT and its degradative products by reduced iron (III) porphyrins and ammonia.** *Chemosphere* 8(3): 151-155; 1979. (22 references)

DDT and its metabolites DDD, DDE, DBP and DDA were incubated in the dark with hematin, ammonia, iron(II) sulphate, iron(III)sulphate, hematoporphyrin, sodium carbonate and sodium dithionate in various carbonate and ammonia produced DDA. DDE was seen to be the final degradation product of DDT when incubated with hematin and ammonia. DDD (TDE) reacted to yield DDA, DDMU and DBP. Hematoporphyrin did not degrade DDT; however, DDT was converted to DDD by iron salts.

79-1556. Giacoia, G. P.; Catz, C. S. (Div. Neonatol., Tulsa Med. Coll., Univ. Oklahoma, Tulsa, OK) **Drugs and pollutants in breast milk.** *Clin. Perinatol.* 6(1): 181-196; 1979. (82 references)

The contamination of human breast milk with a number of drugs and pollutants and the possibilities of passing these contaminants onto the infant are examined. The toxic

effects to the infant depend not on the amount of the substance that is consumed by the mother but on the amount that is present in the site of reception, the breast milk. The importance of the mother-infant model is stressed when examining the passing of pollutants in milk from mother to baby. The mode of passage of drugs and pollutants from the maternal plasma into the breast milk is reviewed as well as the means of storage of pollutants in either the aqueous or fat phases of milk according to the compound oil/water partition coefficient. The mechanisms of gastrointestinal absorption of milk contaminants by the infants, and the factors affecting distribution, metabolism, and excretion of these substances are discussed. Experiments showing the absorption of salicylates from mothers' milk by infants are reviewed. Other environmental pollutants found in breast milk include organochlorine pesticides (DDT, dieldrin, aldrin, heptachlor, hepachlor epoxide, chlordecone, and mirex), PCB, hexachlorophene, and texachloroethylene. The concentration of drugs in breast milk has been shown in a number of studies. The anticoagulant, warfarin, has been found to be a safe therapeutic agent for breast-feeding mothers as it is not transferred in the milk. A number of hormones are found to be transferred to the infant via the breast milk. Radiopharmaceuticals are also found in infants breastfeeding from mothers exposed to these substances. The transfer of components of cigarette and marijuana smoke via the breast milk are also considered. Although it is believed that the theoretical risks are outweighed by the known benefits of breastfeeding, some practical considerations for this practice are given.

79-1557. Jordan, G. L. (Univ. Wisconsin, Madison, WI) **Environmental factors and soil relationships influencing the activity of acetanilide herbicides.** *Diss. Abstr. Int. B* 39(9): 4135; 1979.

Adsorption, desorption, leaching, diffusion, site of uptake, and type of application are important factors influencing the activity of herbicides in soil. Investigations were conducted to evaluate the influence of these factors on the activity of ten acetanilide herbicides. Adsorption and desorption of six ^{14}C-labelled acetanilide herbicides and leaching of ten experimental or commercially formulated acetanilide herbicides were studied in ten Wisconsin soils. Adsorption and desorption were studied by using a slurry method, and leaching by thick-layer soil chromatography. In each soil type, H 22234 and H 26910 were most highly adsorbed; metolachlor intermediately; and propachlor then RE 19790 the least. Over a range of herbicide concentrations (0.75-6.0 μM) the ratio of amount of herbicide adsorbed to herbicide in the equilibrium solution remained constant. Additional studies to determine the influence of soil temperature (4°and 21°C) and pH (4.7, 5.2, 5.8, 6.3, and 7.4) on adsorption were conducted. Adsorption increased at 4°C, while pH had little influence on adsorption. Relative strengths of adsorption, calculated from the temperature studies, indicated that herbicides which were highly adsorbed were not necessarily always the most strongly adsorbed. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 7823069.)

79-1558. Mancini, J. L. (320 Brookmere Court, Ridgewood, NJ 07450) **Analysis framework for photodecomposition in water.** *Environ. Sci. Technol.* 12(12): 1274-1276; 1978. (5 references)

A mathematical schema for the calculation of first order photodecomposition in aqueous solutions is applied to experimental results obtained on the photodecomposition of picloram in distillerd water. The data of the analytical model showed adequate aggreement when applied to the experimental results for picloram. It is suggested that the mathematical model be used in the alteration, minimization and evaluation of experimental measurements.

79-1559. Aharonson, N.; Neubauer, I.; Ishaaya, I.; Raccah, B. (Div. Entomol., Pestic. Chem. & Residue Res. Lab., Volcani Cent., Bet Dagan, Israel) **Residues of croneton and its sulfoxide and sulfone metabolites in citrus (*Clementine trees*) following a soil treatment for the control of *Aphis spiraecola*.** *J. Agric. Food Chem.* 27(2): 265-268; 1979. (11 references)

Residues of the insecticide croneton, [2-(ethylthio) methyl] phenyl *N*-methylcarbamate (ethiofencarb), and its sulfoxide and sulfone metabolites were determined in *Clementine (C. reticulata* Blanco) leaves and fruits following soil treatment with 2, 6, and 18 g of active ingredient (AI) per tree. The analytical procedure was improved to separate croneton from its two oxygen analogues. Croneton was extracted with petrolueum ether and its sulfoxide and sulfone metabolites with chloroform; all were silylated with bis (trimethylsilyl) trifluoroacetamide and determined by gas-liquid chromatography using the flame photometric detector. The carbamate was found to accumulate in the leaves and mainly in its oxidized forms. Soil treatment with 18 g AI/tree resulted in a slow accumulation in the leaves during the first 12 days (up to 2 ppm), followed by a much faster rate. After 42 days the total residue level was 12 ppm (0.4 ppm croneton, 5.6 ppm sulfoxide, and 6.2 ppm sulfone). Residues in the leaves were proportional to the dosage applied to the soil. An average level of 4-6 ppm of the carbamate in the leaves provided satisfactory control of the spirea aphid. Similar results were found when the spirea aphids were fed on a synthetic diet containing similar levels of the insecticide. (Author abstract reprinted by permission of the American Chemical Society)

79-1560. Seiber, J. N.; Madden, S. C.; McChesney, M. M.; Winterlin, W. L. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Toxaphene dissipation from treated cotton field environments: component residual behavior on leaves and in air, soil, and sediments determined by capillary gas chromatography.** *J. Agric. Food Chem.* 27(2): 284-290; 1979. (25 references)

Residues of toxaphene were analyzed in leaf, air, and top soil samples taken up to 58 days following a commercial application at 9 kg/ha to a San Joaquin Valley, California, cotton field. Analyses were by packed column gas-liquid chromtography (GLC) for total toxaphene residues and by

open-tubular (capillary) column GLC for enhanced component resolution. Leaf residues at 50 days following treatment (135 ppm) showed a regular trend toward greater loss of components of higher volatility when compared with the 0-day sample (661 ppm). This was matached by a corresponding enrichment of volatile components in air samples, most noticeable in an early (2-day) samples (1.8 $\mu g/m^3$) but still evident in a later (14-day) sample (1.9 $\mu g/m^3$). Vaporization was indicated to be the major route of loss from foliage, with no noticeable role played by chemical decomposition. Decline from aerated top soil (from 13.1 ppm at 0 day to 6.4 ppm at 58 days) was also primarily by vaporization, but at least one component was significantly degraded. Soil core and irrigation ditch residues sampled more than a year after treatment showed extensive toxaphene component degradation, resulting in selective decline of some components. The evidence indicated that anaerobic reduction occurred in these environmental compartments. (Author abstract reprinted by permission of the American Chemical Society)

79-1561. Rott, B.; Nitz, S.; Korte, F. (Inst. Oekol. Chem., Ges. Strahlen & Umweltforsch., D-8050 Munich, BRD) **Microbial decomposition of sodium pentachlorophenolate.** *J. Agric. Food Chem.* 27(2): 306-310; 1979. (19 references)

During the decomposition of sodium pentachlorophenolate by *Alcaligenes eutrophus, Aeromonas hydrophila* var. *hydrophila* and var. *anaerogenes, Azotobacter chroococcum, Azotobacter vinelandii, Flavobacterium aquatile, Pseudomonas fluorescens, Cytophaga johnsonae, Corynebacterium aquaticum, Brevibacterium testaceum,* and *Arthrobacter globiformis* the following were identified as metabolites: pentachlorophenol acetate, pentachloro anisole, 2,3,4,5- tetrachloro anisole, 2,3,4,6- tetra chloranisole, 2,3,5,6- tetrachloro anisole, 2,3,4,5-tetra chlorophenol, 2,3,5,6- tetrachloro phenol, tetrachloro resorcinol, tetrachloro hydroquinone, and tetrachloro acetechol diacetate, the principal metabolite being pentachlorophenol acetate. Up to 6.2% of the sodium pentachlorophenolate used was recovered as pentachlorophenol acetate, while all other metabolites were found in amounts less than 1% of the starting compound. (Author abstract reprinted by permission of the American Chemical Society.)

79-1562. Smith, A. E. (Res. Stn., Agric. Canada, Regina, Sask. S4P 3A2, Canada) **Extraction of free and bound carboxylic acid residues from field soils treated with the herbicides benzoylprop-ethyl, diclofop-methyl, and flamprop-methyl.** *J. Agric. Food Chem.* 27(2): 428-432; 1979. (17 references)

The breakdown of the herbicidal esters benzoylprop-ethyl, diclofop-methyl, and flamprop-methyl was studied in small field plots at three locations in Saskatchewan after two separate growing seasons. Following extraction of soil samples with aqueous acidic acetonitrile, the parent esters and acid hydrolysis products were determined gas chromatographically. Residues of benzoylprop-ethyl and flamprop-methyl, together with their corresponding acids, were recovered from treated soils at all sites both years, whereas no significant amounts of diclofop-methyl (or acid) were observed in any sampled soils. Following extraction with the acidic acetonitrile solvent, the soil residues were reextracted with cold aqueous sodium hydroxyide or hot aqueous triethanolamine solutions to release any benzoylprop, diclofop, or flamprop acids held on the soil in a bound form. From these alkaline digestion studies and experiments conducted to compare the extractions of the three herbicidal acids from fortified soils using cold sodium hydroxide and hot triethanolamine as extractants, it was concluded that any such bound residues could only be present in negligible quantities. (Author abstract reprinted by permission of the American Chemical Society)

79-1563. Wauchope, R. D. (South Weed Sci. Lab., Sci. Educ. Adm., Stoneville, MS 38776) **The pesticide content of surface water draining from agricultural fields - a review.** *J. Environ. Qual.* 7(4): 459-472; 1978. (69 references)

The literature on pesticide losses in runoff waters from agricultural fields is reviewed. For the majority of commercial pesticides, total losses are 0.5% or less of the amounts applied, unless severe rainfall conditions occur within 1-2 wk after application. Exceptions are the organochlorine insecticides, which may lose about 1% regardless of weather pattern because of their long persistence; and soil surface-applied, wettable-powder formulations of herbicides, which may lose up to 5%, depending on weather and slope, because of the ease of washoff of the powder. Pesticides with solubilities of 10 ppm or higher are lost mainly in the water phase of runoff, and erosion control practices will have little effect on such losses. Organochlorine pesticides, paraquat, and arsenical pesticides, however, are important cases of pesticides which are strongly adsorbed by sediments, and erosion control can be important in controlling losses of these compounds. The behavior and fate of pesticides in streams receiving runoff is generally not known. Information on such factors as time and distance of impact of a given runoff event, ability of local ecosystems to recover from transient pesticide concentrations, and dissipation or concentration processes in aquatic ecosystems will have to be obtained before edge-of-field pesticide losses can be related to water quality in receiving waters. (Author abstract by permission)

79-1564. Srinath, D.; Ramchandani, N. P. (Dir. Plant Prot., Quar. & Storage, Minist. Agric. & Irrig., Faridabad 121001, India) **Investigations on fumigation of walnuts with methyl bromide.** *J. Food Sci. Technol.* 15(5): 192-194; 1978. (2 references)

Methyl bromide fumigant was tested on adults of *Tribolium castaneum,* a species which is a common pest of walnuts to determine the effects on insect mortality, walnut quality, and bromine residues in walnut kernels. Vacuum fumigation and normal fumigation of methyl bromide was carried out in test chambers containing 20 insects. Methyl bromide was applied at a dosage of 2.8 $kg/100m^3$ for 16 hr to the insects. Walnuts intended for residue analysis received

the same dosage 3 times at 15 day intervals. An ashing method was used for bromide analysis on walnut samples collected after each fumigation. Mortality to the insects was 100%. Walnut flavor began to decline with the second treatment of methyl bromide and after the third treatment, walnuts became almost inedible for samples exposed without the shell. Residues of bromine in walnut kernels after the first and second fumigation under vacuum conditions were higher than those found in walnuts fumigated under normal atmospheric pressure conditions. After the third fumigation, residue levels were higher in samples treated under normal atmospheric conditions than in those treated under vacuum conditions. It is suggested that the conventional schedules for walnut fumigation be reevaluated when preparing cargoes of walnuts for shipment.

79-1565. Gupta, H. C.; Pareek, B. L. (Dep. Entomol., Coll. Agric., Univ. Udaipur, Udaipur, India) **Removal of carbaryl residues from onion.** *J. Food Sci. Technol.* 15(5): 215-216; 1978. (7 references)

Carbaryl in 0.1 and 0.2% suspensions was applied at 450 l/ha on a 70 day transplanted onion crop. Each treatment was done three times, and onion bulbs and leaf samples were collected weekly up to 1 mo. Samples were washed in tap water for 1, 3, or 5 min and then were analyzed for carbaryl residues by a coagulation procedure. Residues of 45.3 ppm were found on onion leaves sprayed with the 0.1% carbaryl suspension. This amount was diminished to 18.7, 5.4 and 2.1 ppm after 1, 2, and 3 wk, respectively. Residue removal occurred to the extent of 88.5, 97.6 and 100.0% of the original amount after washing for 1, 3, and 5 min, respectively. In each case, the length of washing time increased the percentage of residue removal, except in cases where penetration had taken place. In these cases, even 5 min of washing at 2 wk intervals did not remove the carbaryl residues. Carbaryl deposits of 119.7 ppm due to the application of the 0.2% spray were washed out by 89.6 to 99.4%. At each time interval tested, the level of detectable residue in onion bulbs was below the level that indicates systemic activity.

79-1566. Hunter, R.; Wallace, A.; Romney, E. M. (P. O. Box 495, Mercury, NV 89023) **Persistent atrazine toxicity in Mohave Desert shrub communities.** *J. Range Manage.* 31(3): 199-203; 1978. (29 references)

Atrazine was applied at 11.2 kg/ha active ingredient to areas in the northern Mohave Desert in 1967 and 1968 to destroy perennial shrub cover. Many of the species survived the spraying and invading species became established by 1975 on fertile mounds under killed shrubs. In greenhouse tests, in comparison with control soil samples, the atrazine-treated soils showed 65 to 95% mortality of species. This high degree of phytotoxicity was attributed to the persistence of the herbicide. The persistence of atrazine in the desert soil was believed to be due to the lack of microbial decomposition. In conjunction with low levels of microbial decomposition are the factors of low organic C, high pH, low moisture content, and extreme surface temperature which may also affect the persistence of the herbicide.

79-1567. Riemer, F.; Eggers, H.; Moselage, A.; Grisk, A. (Inst. Pharmacol. & Toxikol., Ernst Moritz Arndt Univ., Greifswald, DDR) **DDT-Gehalt von Moeweneiern und sein Einfluss auf die Schalendicke. [DDT levels in birds eggs and the effect on shell thickness.]** *Monatsh. Veterinaermed.* 33(4): 126-8; 1978. (7 references) (German)

DDT levels and those of its metabolites DDE and DDD (TDE) were determined in eggs of black-headed gulls from six DDR wildlife preserves by extracting the homgenized content of the eggs with petrol ether, purifying the organic phase on an oleum column, and subjecting the residue following evaporation of the solvent to thin layer chromatography. The DDT plus DDD content generally did not exceed 0.1 ppm except in eggs from one colony where DDT content was 0.25 ppm, DDT 1.34 ppm, and DDD 1.87 ppm without a plausible explanation. In all cases the DDE concentration exceeded that of DDT and DDD (approximately 8 to 10 fold) with the total amounts (DDT, DDE, DDD) being close to 1 ppm in birds of five of the six bird colonies, a relatively low level of contamination. Correlation coefficients calculated for the relationship between egg shell thickness and DDE or total chlorinated organocompound level were smaller than 0.4 which would indicate the absence of a clear correlation between shell thickness and pesticide contamination.

79-1568. Dobbs, A. J.; Grant, C. (Princes Risborough Lab., Dep. Environ., Aylesbury, Buckinghamshire, England) **Photolysis of highly chlorinated dibenzo-*p*-dioxins by sunlight.** *Nature (London)* 278(5700): 163-165; 1979. (10 references)

The photodegradation of polychlorinated dibenzodioxins was studied to determine the relative toxicity according to chemical structure of the decomposition products. It is generally agreed upon that the number and position of chlorine atoms in these compounds determine the relative toxicity of the molecule. 2,3,7,8-TCDD is at least 800 times more toxic than the tetrachloro dibenzodioxin chlorinated at the 1,2,3,4-positions. The accurate identification of these compounds as contaminants in environmental systems becomes important in assessing the toxic effects that may be expected. The photolysis of octachloro dibenzodioxin (OCDD), the contaminant of the widely used pesticide pentachlorophenol (PCP) has been studied in hexane solutions. Three hexachloro dibenzodioxin isomers were identified as a result of the photodegradation of OCDD. Half-life values were calculated for these isomers and reaction mechanisms were proposed. Other experiments on chlorinated compounds suggest similar behavior under photolytic conditions as that observed for OCDD. These findings suggest that the molecules are more likely to degrade in the presence of sunlight to a less toxic form.

79-1569. Love, J. L.; Ferguson, A. M. (Chem. Div., DSIR, Petone, New Zealand) **Residues of phosmet on kiwifruit.** *N.*

Z. J. Exp. Agric. 6(2): 123-126; 1978. (4 references)

A trial spraying of kiwifruit vines with phosmet was conducted in New Zealand from 1974-1975 to determine the residue activity of this insecticide. Phosmet was applied at rates of 1.6 - 3.9 AI/ha and fruits was picked on day 1, 2, 5, and 7 after spraying. Samples were shipped to the laboratory, cut, peeled, frozen and later analyzed by gas chromatography. Results showed that very little of the pesticide penetrated into the flesh of the fruit. Because of the slow rate of decay, accumulated residues of phosmet could be expected after numerous applications. Repeat experiments in the 1975-1976 gave similar results. Because the residues of phosmet did not penetrate into the edible portion of the fruit to levels higher than 10 mg/kg (maximum acceptable concentration), the use of phosmet for control of insects on kiwifruit was found to be acceptable.

79-1570. Gross, D.; Laanio, T.; Dupuis, G.; Esser, H. O. (Agrochem. Div., Ciba-Geigy Ltd., CH-4002 Basle, Switzerland) **The metabolic behavior of chlorotoluron in wheat and soil.** *Pestic. Biochem. Physiol.* 10(1): 49-59; 1979. (11 references)

Winter wheat plants, 4-wk-old, were placed in a nutrient solution which contained 3.1 ppm ^{14}C-chlorotoluron. Approximately 32% of the initial radioactivity was absorbed within the first 4 days of exposure. A rapid translocation occurred with 79 and 86% of the radioactivity found in the shoots after the 4-day uptake and after the 4-day uptake plus 10-day depletion periods, respectively. Total radioactivity present in 212 plants after 96 days following treatment was 2-3% of the dose applied to the experimental field plot. At harvest time 2.8 ppm chlorotoluron was found in the straw, with the ears containing less than 4% of the total radioactivity present in the plant. As no traces of benzoic acid were found it was concluded that the young wheat plant is not able to oxidize the benzyl alcohol metabolites to benzoic acid metabolites. The metabolic pathway of chlorotoluron degradation in wheat and soil is discussed in detail.

79-1571. Kushwaha, K. S.; Gupta, H. C.; Kavadia, N. S. (Dep. Entomol., Coll. Agric., Udaipur, India) **Persistence and dissipation of aldrin and dieldrin in soil - a review.** *Pesticides* 12(6): 14-18; 1978. (34 references)

A review of the literature on the degradation and persistence of aldrin and dieldrin in soil is given in table format. The initial dosage applied, type of soil, time after application that residues persisted, level of aldrin and dieldrin residues detected by chemical or bioasay in ppm, and the references cited for each study are included. The findings of these studies show that the larger applications of aldrin usually persist in the soil for longer periods of time. The persistence of the insecticides are also dependent on soil type. The bioassay method used by various researchers was usually a test for the conversion of aldrin to its toxic epoxide, dieldrin. The test insect used in this bioassay did not differentiate between the toxicity of aldrin and its epoxide.

79-1572. Geissbuhler, H.; Baron, R. L.; Korte, F. (Ciba-Geigy, Basel, Switzerland) **Definitions and guidelines for describing and evaluating pesticide residues.** *Pure Appl. Chem.* 51(3): 677,679-680; 1979.

To better describe and evaluate residues and contribute to improved communications, several terms are defined and several guidelines are outlined. Pesticide residues and significant pesticide residues are defined. Guidelines for the description of a residue are presented. Foods that may contain residues are discussed, as are the criteria for determining significance or non-significance of a pesticide residue.

79-1573. Rao, P. S. G.; Davidson, J. M.; Jessup, R. E.; Selim, H. M. (Soil Sci. Dep., Univ. Florida, Gainesville, FL 32611) **Evaluation of conceptual models for describing nonequilibrium adsorption-desorption of pesticides during steady-flow in soils.** *Soil Sci. Soc. Am. J.* 43(1): 22-28; 1979. (23 references)

Breakthrough curves (BTC) from miscible displacement of two pesticides through three soils were measured for two input concentrations of each pesticide. These BTC data were used to evaluate two conceptual models for describing the nonequilibrium absorption-desorption of pesticides in soils under steady-state of sites was assumed to be instantaneous, while the rate of adsorption on the second group of sites followed either non-linear reversible kinetics (Model I) or was a diffusion-controlled process (Model II). Parameters in both models were estimated by curve-fitting model predictions to one set of measured BTC data using a nonlinear least-squares optimization procedure. These parameter values were then used to verify the conceptual models by comparing simulated and measured BTC for a different input concentration. A different set of model parameters were required to describe the BTC data for each input concentration for the same soil-pesticide combination. The measured $^{3}H_2O$ BTC for all three soils were symmetrical in shape with no apparent tailing. Evaluation of Model I and II using these BTC suggested that the mobile-immobile water concept may not be applicable to the three soils used in this study. (Author abstract by permission)

79-1574. Bourquin, A. W.; Gibson, D. T. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Microbial degradation of halogenated hydrocarbons.** In: *Water Chlorination: Environmental Impact and Health Effects.* Jolley, R. L., *Ed. (Ann Arbor: Ann Arbor Science)* 2(Chapter 19): 253-264; 1977. (21 references)

Various organochlorine compounds have entered the environment due to their usefulness, such as in agriculture where these chemicals can be used as herbicides. Mechanisms which are available for the degradation of these compounds include microbial degradation. It is suggested that biodegradation of synthetic halogenated chemicals occurs more readily if the compound bears some similarity to naturally occurring compounds. Many synthetic organic pesticides do not bear a very close relationship to natural compounds. Specific pathways of degradation are described for certain agricultur-

al chemicals. The mineralization of the extensively used herbicide 2,4-D is described. Enzyme systems capable of degrading halogenated aliphatic and aromatic hydrocarbons are discussed.

79-1575. Young, D. R.; Heesen, T. C. (South. California Coast. Water Res. Proj., El Segundo, CA 90245) **DDT, PCB, and chlorinated benzenes in the marine ecosystem off Southern California.** In: *Water Chlorination: Environmental Impact and Health Effects,* Jolley, R. L., ed. (Ann Arbor: Ann Arbor Science) 2(Chapter 20): 267-290; 1977. (29 references)

Studies concerning the input, distribution, and impact of DDT and PCB to the Southern California Bight are summarized. In the early 1970's, discharge of municipal wastes under the water was the major source of DDT and PCB residue contamination of the coastal waters. Concentrations of total DDT were measured in the soft tissue of the intertidal mussel (*Mytilus californiannus*). Studies have indicated the great part played by bottom sediments in the persistence of the higher molecular weight chlorinated hydrocarbons as pollutants. Histological examinations of various bird species of the area were also performed. All the studies have indicated that the contamination of the bottom sediments of the ocean can continue long after the dominant inputs have occurred. The various factors responsible for the contamination of the Southern California Bight have caused the death of a number of captive marine birds maintained on a diet of queenfish taken from this area. It is suggested that fishing off the Palos Verdes Peninsula be discontinued until an extensive survey of major seafood species from this area is conducted.

79-1576. Romanowski, R. R.; Borowy, A. (Dep. Hortic., Purdue Univ., West Lafeyette, IN 47907) **Soil persistence of napropamide.** *Weed Sci.* 27(2): 151-153; 1979. (6 references)

The persistence of napropamide [2- (α-naphthoxy)-*N,N*-diethylpropionamide] applied at 2.24 and 4.48 kg/ha was studied for 2 yr at two locations in the field. Wheat (*Triticum aestivum* L. 'Arthur 71') was severely injured when sown in the fall following a spring application of napropamide. A wheat root bioassay also showed that napropamide was persistent for more than 180 days. The yield of sweet corn (*Zea mays* L. var. *rugosa* Bonaf. 'Gold Cup') was not significantly reduced when grown 1 yr after the initial application of napropamide. (Author abstract by permission)

79-1577. Hurto, K. A.; Turgeon, A. J.; Cole, M. A. (Dep. Plant & Soil Sci., Univ. Massachusetts, Amherst, MA 01003) **Degradation of benefin and DCPA in thatch and soil from a Kentucky bluegrass (*Poa pratensis*) turf.** *Weed Sci.* 27(2): 154-157; 1979. (15 references)

The rates of degradation of ^{14}C-benefin (*N*-butyl-*N*-ethyl- α,α,α- trifluoro- 2,6-dinitro- *p*- toluidine) and ^{14}C-DCPA (dimethyl tetrachloro terephthalate) were significantly faster in thatch than in soil from a Kentucky bluegrass (*Poa pratensis* L.) turf. These results suggest that herbicides applied preemergence in turf will persist for shorter periods of time because of the carbon-enriched medium (thatch) and that higher rates or more frequent applications may be required to maintain concentrations at effective levels. (Author abstract by permission)

79-1578. Khan, S. U.; Marriage, P. B. (Chem. Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ont. K1A OC6, Canada) **Residues of simazine and hydroxysimazine in an orchard soil.** *Weed Sci.* 27(2): 238-241; 1979. (22 references)

Simazine [2-chloro- 4,6-bis (ethylamino)- *s*-triazine] was applied annually at 4.5 kg/ha to uncultivated sandy loam of peach (*Prunus persica* Batsch) for 7 yr (orchard A) and 9 yr (orchard B). Simazine and the metabolite, hydroxysimazine [2-hydroxy- 4,6-bis (ethylamino)- *s*-triazine] as determined by gas chromatography (GC) persisted for 40 and 28 mo in soil of orchard A and B, respectively. However, no progressive accumulation of either compound in large quantities occurred from repeated annual applications of simazine to the orchard soils. No metabolites other than hydroxysimazine were detected. Hydroxysimazine was degraded more slowly than simazine and the residue levels of hydroxysimazine were at least 40 times those of simazine, 40 mo and 28 mo after the final application in orchard A and B, respectively. Both simazine and hydroxysimazine residues were detected in the upper 30 cm of the soil profile. (Author abstract by permission)

79-1579. Suess, A.; Eben, C. (Bayer. Landesanst. Bodenkult. & Plfanzenbau, D-8000 Munich, BRD) **Abbau von Monolinuron in verschiedenen Boeden. [Degradation of monolinuron in different soil types.]** *Z. Pflanzenernaehr. Bodenkd.* 141(2): 217-229; 1978. (18 references) (German)

The degradation of ^{14}C-methyl, -ureido- and -phenyl-labeled monolinuron in different soil types was studied under laboratory conditions. Ureido-group mineralization was followed by two methods. Results showed that mineralization depends on the soil type. There was a definite degradation pattern observed for the herbicide monolinuron. The release of labeled CO_2 from the methyl- and ureido-group was more rapid than its release from the phenyl ring. Two radioactive substances not yet identified were found in extracts of soil treated with monolinuron. Soil respiration was not affected by the application of monolinuron. No degradation of monolinuron occured in soil that had been sterilized.

See also **79-1502,** *and* **78-1503.**

79-1580. Glass, R. I. ; Lyness, R. N.; Mengle, D. C.; Powell, K. E.; Kahn, E. (Chronic Dis. Div., Bur. Epidemiol., CDC Atlanta, GA 30333) **Sperm count depression in pesticide applicators exposed to dibromochloropropane.** *Am. J. Epidemiol.* 109(3): 246-251; 1979. (12 references)

A group of 112 professional applicators of pesticides were selected for study of the effects of exposure to DBCP. Of the original group of 112, 96 cooperated with the study. Of these 96, 9 complained of clinical infertility. Two of these nine had sperm counts of less than 10 million sperm per ml. One of these two men had been extensively evaluated for infertility ten yr earlier and had only recent minimal DBCP exposure. The other man was an irrigation setup worker with extensive DBCP contact. Five of the men had varied exposures and 2 had no history of exposure to DBCP itself. No relation was found between clinical infertility and exposure to DBCP. However, there was an association between the length of exposure to DBCP and sperm count depressions. It was also noted that elevation of serum follicle stimulation hormone was associated with the extent of DBCP exposure in the current year. No such effect was found for the luteinizing hormone.

79-1581. Gold, E.; Gordis, L.; Tonascia, J.; Szklo, M. (Dep. Epidemiol., Johns Hopkins Sch. Hyg., Baltimore, MD 21205) **Risk factors for brain tumors in children.** *Am. J. Epidemiol.* 109(3): 309-319; 1979. (49 references)

In a study which compared children with brain tumors against the normal population of similarly aged children, it was determined that more children with brain tumors and children with other cancers had been exposed to insecticides than was the case for normally healthy children. To determine whether exposure to insecticides had occurred, the parents of the children were questioned about exterminations in the household prior to the diagnosis of the disease in the index child. More children with brain tumors were found to have been exposed to insecticides by this means than were normal children or children with other types of cancers.

79-1582. Morgan, D. P.; Lin, L. I. (Pestic. Epidemiol. Stud. Program, Inst. Agric. Med., Univ Iowa Coll. Med., Oakdale, IA 52319) **Blood organochlorine pesticide concentrations, clinical hematology and biochemistry in workers occupationally exposed to pesticides.** *Arch. Environ. Contam. Toxicol.* 7(4): 423-447; 1978. (36 references)

Organochlorine pesticide concentrations in blood and various clinical test variables were measured in 2,620 pesticide-exposed subjects and in 1,049 persons not occupationally exposed to pesticides. Differences in the pesticide contents of blood were identified in relation to geography, age, and occupational exposure. Analysis of hematologic and biochemical variables in terms of broad occupational categories revealed only very limited differences, but relationships of certain biochemical tests to serum organochlorine pesticide contents suggested subtle effects of these pesticides on liver function. (Author abstract by permission)

79-1583. Wicker, G. W.; Williams, W. A.; Guthrie, F. E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607) **Exposure of field workers to organophosphorus insecticides: sweet corn and peaches.** *Arch. Environ. Contam. Toxicol.* 8(2): 175-182; 1979. (28 references)

Plasma and red blood cell cholinesterase levels of professional agricultural workers engaged in packing sweet corn and thinning peaches were monitored. Workers with extensive contact with mechanically harvested sweet corn (the corn had been treated one or two days before harvest with a combination of ethyl and methyl parathion) exhibited significant depression of cholinesterase. Gloves, worn by 40% of the workers, provided some protection from absorption of pesticide residues. No significant cholinesterase depression was found in workers thinning peaches which had been previously treated with parathion. (Author abstract by permission)

79-1584. Kiraly, J.; Szentesi, I.; Ruzicska, M.; Czeize, A.* (Lab. Hum. Genet., Natl. Inst. Hyg., H-1966 Budapest, Hungary) **Chromosome studies in workers producing organophosphate insecticides.** *Arch. Environ. Contam. Toxicol.* 8(3): 309-319; 1979. (19 references)

The chromatid-type and labile chromosome-type aberrations occurred frequently in the factory-employees control group, probably caused by airborne pollution. Workers producing TECB (1,2,4,5-tetrachlorobenzene) showed a cluster of chromosome aberrations. No appreciable increase was found in the lindane workers: chromatid-type aberrations were moderately increased in workers in the Basudin E (diazinon) and the Safidon 40 WP (phosmet) groups; stable chromosome-type aberrations were observed in the Ditrifon 50 (trichlorofon) and the Basudin E groups. (Author abstract by permission)

79-1585. Simeon, V.; Wilhelm, K.; Granov, A.; Besarovic-Lazarev, S.; Buntic, A.; Fajdetic, A.; Binenfeld, Z. (Inst. Med. Res. & Occup. Health, YU-41001 Zagreb, Yugoslavia) **1,3-Bispyridinium-dimethylether mono- and dioximes: synthesis, reactivating potency and therapeutic effect in experimental poisoning by organophosphorus compounds.** *Arch. Toxicol.* 41(4): 301-306; 1979. (14 references)

Nine bispyridinium oximes containing two pyridinium rings linked by dimethylether were synthesized. Each compound had on one of the pyridinium rings a hydroxyiminomethyl group in position 2 or 4, while the other ring was unsubstituted or had a methyl or a hydroxyiminomethyl group in position 2 or 4. The reactivating potency and therapeutic effect of the oximes were tested on two organophosphates: O,O-dimethyl -2,2- dichlorovinylphosphate (DDVP, dichlorvos) and O-ethyl-S-(2-diisopropylaminoethyl)- methylphosphonothioate (VX). The reactivation was measured on human erythrocyte acetylcholinesterase and the therapeutic effect was evaluated on male albino rats. The oximes with a hydroxyiminomethyl group in position 4 in the pyridinium ring were good reactivators of both phosphorylated and phosphonylated acetylcholinestease. They were also very effective

given together with atropine against VX and DDVP poisoning. The compounds are almost as effective as PAM-2, but PAM-2 is less toxic. (Author abstract by permission)

79-1586. Vucinovic, B. (Intern. Ward. General Hosp., Split, Yugoslavia) **Cetiri slucaja otrovanja parakvatom lijecena na internom odjelu opce bolnice u splitu. [Four cases of poisoning with paraquat.]** *Arh. Hig. Rada Toksikol.* 29(3): 261-265; 1978. (12 references) (Serbo-Croatian)

Four cases treated at the Internal Ward of the General Hospital in Split, Yugoslavia between 1975-1978 for accidental poisoning with paraquat are described. In one fatal case, a progressive pulmonary fibrosis was noted in addition to a kidney lesion. This patient died on the 19th day after paraquat ingestion. Renal function was also impaired in the other three patients but returned to normal after a few weeks of treatment. Paraquat was found in the urine of all four patients at various intervals after poisoning.

79-1587. Verberk, M. M.; Rooyakkers-Beemster, T.; De Vlieger, M.; Van Vliet, A. G. M. (Coronel Lab., Fac. Med., Univ. Amsterdam, Amsterdam, The Netherlands) **Bromine in blood, EEG and transaminases in methyl bromide workers.** *Br. J. Ind. Med.* 36(1): 59-62; 1979. (11 references)

Thirty-three men occupationally exposed to methyl bromide for periods of a few mo to 11 yr were studied. Blood bromine levels ranged from 4 to 23 ppm. Slight electroencephalographic changes and a small increase in serum transaminases were related to bromine concentrations in the blood. However, no relationship was found between subjective symptoms, general neurological examination, or the results of serum protein electrophoresis.

79-1588. Knaak, J. B.; Maddy, K. T.; Khalifa, S. (California Dep. Food & Agric. Sacramento, CA) **Alkyl phosphate metabolite levels in the urine of field workers giving blood for cholinesterase test in California.** *Bull. Environ. Contam. Toxicol.* 21(3): 375-380; 1979. (3 references)

A study was performed to determine alkyl phosphates in the urine and the level of cholinesterase activity in the blood of California farm workers exposed to organophosphates. Urine analysis showed that of the 154 samples, 25 contained trace quantities of DMP, DEP, and DMDTP. Blood cholinesterase activity for those persons with trace alkyl phosphates was not significantly different from the activity of persons without alkyl phosphate levels in their urine. The urine analysis indicates that small amounts of pesticides were absorbed, but not enough to decrease cholinesterase activity.

79-1589. Miller, H. J.; Aronovski, I.; Cucos, S.; Wassermann, D.; Wassermann, M. (Dep. Occup. Health, Hebrew Univ., Hadassah Med. Sch., Jerusalem, Israel) **Effects of organochlorine insecticides on serum proteins in occupationally exposed people.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 533-538; 1979. (19 references)

Studies were performed on persons exposed to organochlorine insecticides (OCI) to determine the effects on serum proteins. Three groups were analyzed. Group 1 had DDT plasma levels greater than 100 ppb in persons occupationally exposed to OCI. Group 2 had DDT plasma levels less than 40 ppb in person occupationally exposed to OCI. Group 3 had DDT levels less than 40 ppb in persons not occupationally exposed to OCI. Serum proteins in groups 1 and 2 decreased, mainly at the expense of globulins, since albumin serum levels were not significantly different than controls. The α-1 globulin plasma level was lower in group 2 than in groups 1 or 3. Serum β-globulin concentrations were significantly lower in the exposed groups when compared to the control.

79-1590. Lopukhin, Iu. M.; Molodenkov, M. N.; Shurkalin, B. K.; Evseev, N. G. (N. I. Pirogov Second Med. Inst., Moscow, USSR) **Plazmosorbtsiia pri lechenii ekzogennykh i endogennykh intoksikatsii. [Plasmasorbtion in the treatment of endogenous and exogenous poisoning.]** *Chirurgiia (Moscow)* (3): 38-41; 1979. (4 references) (Russian)

The therapeutic efficacy of plasmasorbtion was evaluated in 34 patients with hepatic insufficiency and 11 patients with symptoms of exogenous poisoning (7 had exposure to organophosphorus insecticides (OPI) and 4 had exposure to barbiturates). Plasmasorbtion during expogenous poisonings was performed for quick elimination of the toxic agent, when other methods of detoxication (peritoneal dialysis, hemadialysis) were proved to be ineffective. Plasma perfusion resulted in significant decrease in the concentration of both OPI and barbiturates (a 120-min perfusion on 3 column in 1 patient decreased the metaphos (methyl parathion) level from 0.265 g/l to 0.053 g/l). Of 11 patients with symptoms of exogenous poisoning, 4 died.

79-1591. Heath, C. W., Jr. (Chronic Dis. Div., Bur. Epidemiol., CDC, Atlanta, GA 30333) **Environmental pollutants and the epidemiology of cancer.** *Environ. Health Perspect.* 27: 7-10; 1978. (17 references)

One factor which makes epidemiology studies of cancer difficult is the fact that 10 to 20 yr can intervene from exposure to the development of detectable disease. Thus the exposure in many cases continues during the time the disease is developing. The Kepone (chlordecone) exposures in the chemical plant in Hopewell, Virginia are discussed. The seriousness of the uncontrolled occupational exposure to this chlorinated hydrocarbon insecticide caused operations at that plant to be stopped in July of 1975, after excessive exposure took place between March 1974 and July 1975. In this case, not only workers were exposed, but also neighborhoods surrounding the plant, and the entire James River by way of the Hopewell sewage treatment system. Epidemiological studies are currently being formulated to allow scientists to trace the course of this exposure as it regards disease development over the next years. Findings of hepatic tumors in animals exposed to Kepone in the lab have made this epidemiological fol-

low-up extremely important.

79-1592. Pettinati, L.; Perrelli, G. (Cattedra Med. Prev. Lav., Univ. Torino, Torin, Italy) **I pesticidi in patologia rurale. [Pesticides as a cause of rural disease.]** *Minerva Med.* 70(12): 867-872; 1979. (14 references) (Italian)

Italian laws forbidding or restricting the use of certain widely used pesticides in agriculture are cited. A classification of pesticides in groups on the basis of toxicity (toxic = organophosphorus compounds, noxious = carbamates, caution required = hexachlorobenzene, and less toxic compounds not requiring labeling) is given. The clinical picture and forms of occupational intoxications by inorganic compounds (Bordeaux mix, arsenites, arsenates) and organic compounds (nicotine, pyrethrins, rotenone, organochlorine and organophosphorus compounds, carbamates, alkylmercury compounds, diquat, paraquat, phenol and cresol derivatives) are reviewed with special emphasis on dioxin and acetylcholinesterase inhibitors.

79-1593. Muehlendahl, K. E.; Etzold, R.; Krienke, E. G. (Beratungstelle Vergiftung serscheinungen, Univ. Kinderklin., Freie Univ., Berlin, BRD) **Vergiftungen mit koagulationshemmenden Rattengiften. [Intoxication with anticoagulant rodenticides.]** *Monatsschr. Kinderheikd.* 127(3): 156-158; 1979. (4 references) (German)

Usually the ingestion of rodenticides is not dangerous to humans. Accidental ingestion in children and attempted suicidal ingestion in adults resulted in only 9 out of 77 cases of increased thromboplastin time in children and 7 out of 13 cases in adults. No serious changes in plasmatic blood coagulation were observed. In all incidents, vitamin K_1 should be administered as an antidote against rodenticides containing anticoagulants. Induced emesis and gastric lavage are usually not necessary.

79-1594. Takayama, J.; Numajiri, S. (Dep. Pediatr., Jap. Red-Cross Med. Cent., Tokyo, Japan) **[A serious case of methyl bromide intoxication.]** *Nippon Shonika Gakkai Zasshi (Acta Pediatr. Jpn.)* 83(3): 332-333; 1979. (Japanese)

After spraying methyl bromide in a storeroom of a home, all four residents of the house became ill with general spasms. A girl 11 yr of age showed a serum concentration of bromide ion of 44.5 mg/dl and frequent appearance of general myoclonia which was followed by coma. The administration of several anticonvulsants had no effects and so a muscle relaxer was tried. The patient then showed decerebrate rigidity of the extremities, however, her consiousness was gradually recovered with a tendency of intention spasms which also disappeared gradually. The course was followed with EEG and EMG. After the disappearance of myoclonia, a periodic high amplitude slow wave discharge appeared on the EEG. Characteristic action myoclonia remained on the right upper extremity. Serum concentration of bromide ion did not show any correlation with the clinical picture suggesting that the toxicity of methyl bromide is due to the methyl group rather than the bromide ion.

79-1595. Clement, J. G. (Def. Res. Establ. Suffield, Biomed. Sect., Ralston, Alberta TOJ 2NO, Canada) **Efficacy of pro-PAM (*N*-methyl- 1,6-dihydropyridine- 2-carbaldoxime hydrochloride) as a prophylaxis against organophosphate poisoning.** *Toxicol. Appl. Pharmacol.* 47(2): 305-311; 1979. (29 references)

The efficacy of Pro-PAM (*N*-methyl- 1,6-dihydropyridine- 2-carbaldoxime hydrochloride) was compared to pyridine-2-aldoxime chloride (PAM) as a prophylaxis against organophosphate poisoning in mice and guinea pigs. Pro-PAM was generally less toxic than PAM in mice and pH of the vehicle did not appear to alter the toxicity of Pro-PAM. Pro-PAM alone and combined with atropine improved the protective ratio (PR) against DFP and sarin in mice, whereas it improved very slightly the PR against soman in guinea pigs. The PR obtained with Pro-PAM combined with carbamate prophylaxis and atropine therapy versus soman poisoning was inferior to that obtained with PAM. In most cases Pro-PAM and atropine prophylaxis produced higher brain AChE activity than PAM and atropine; however, there was no correlation between brain acetylcholinesterase activity and survival. Pro-PAM was not a significant improvement over PAM with regard to prophylaxis against organophosphorus poisoning. (Author abstract by permission)

79-1596. Amure, J.; Stuart, J. C. (Author address not given) **Dieldrin toxicity in poultry associated with wood shavings.** *Vet. Rec.* 102(17): 387; 1978.

This paper reports on two instances in which poultry (6 to 12 wk old broiler breeders) were believed to be exposed to dieldrin via wood shavings. One incident produced 30% mortality and the other 3%. It was observed that deaths did not stop until approximately 2 wk after the litter was changed. The symptoms of the toxicity were that birds appeared dull and soon began to show convulsive movements of the head and neck. Post mortem examinations showed clogging of the mouth and esophagus with wood shavings. The authors hope to publish further details shortly, but suggest that these present findings be viewed as a warning of possible pesticidal toxicity to poultry.

79-1597. Barker, R. J.; Lehner, Y.; Kunzmann, M. R. (Bee Res. Lab., Sci. & Educ. Adm., USDA, Tuscon, AZ) **Pesticides and honey bees: the danger of microencapsulated formulation.** *Z. Naturforsch. Teil C* 34(1-2): 153-156; 1979. (10 references)

The effects of microencapsulated formulations of methyl parathion on the honey bee, *Apis Mellifera* L. are examined. This formulation of the insecticide first appeared as PENNCAP-M with a particle size very close to that of entomophilous pollen (30-50 μm). Often the micro-particles adhere to branch hairs of foraging bees and are stored in the pollen baskets and carried back to the hive. The timed-release

of the active insecticidal ingredient within the hive is believed to be dangerous to the bees. Pollenating bees are important for the cultivation of many crops each year. Methyl parathion also finds its way into pollen particles which are carried back to the hives by worker bees. methyl parathion was found to be toxic to bees when fed in sucrose syrup in laboratory tests in both an emulsifieable concentrate and an encapsulated form. PENNCAP-M particles could be found in the midgut of bees that had been foraging on sprayed fields. Although much of the hazard to bees occurs as a result of failure to adhere to spray regulations for microencapsulated formulations, pesticide manufactures are still searching for ways to reduce the toxicity of these compounds to helpful non-target insects.

See also **79-1518** *and* **79-1526.**

79-1598. Kato, N.; Yoshida, A. (Dep. Agric. Chem., Nagoya Univ., Nagoya 464, Japan) **Effects of some fat-soluble chemicals on plasma cholesterol and urinary ascorbic acid in rats.** *Agric. Biol. Chem.* 43(1): 191-192; 1979. (13 references)

Male rats were kept on normal diets supplemented with the fat-soluble compounds PCB (0.1%), DDT (0.1%), pentobarbital (0.05%). chloretone (acetone chloroform) (0.04%), BHT (2,6-di- *tert*- butyl-*p*- cresol) (0.1%), and aminopyrine (0.1%) to determine the ascorbic acid and cholesterol metabolism and liver microsomal aniline hydroxylase activity. After 15 days on the special diets the experimental rats and the control rats were sacrificed and liver homogenates were prepared. Plasma cholesterol was measured, and ascorbic acid activity was determined from urine samples collected earlier on day 8 and 9. *p*-Aminophenol formation was determined as an indicator of aniline hydroxylase activity. Results showed that dietary PCB, phenobarbital, and DDT produced a cholesterolemic activity in the rat. There was a correlation between aniline hydroxylase activity and plasma cholesterol levels. As a result of the determination of a quantitative relationship between the experimental chemicals and urinary excretion of ascorbic acid and drug-metabolizing enzymes, a significant increase in the urinary excretion of ascorbic acid was found with a coefficient of aniline hydroxylase activity of 0.84. It is suggested that urinary ascorbic acid measurement might be used as a sensitive and rapid indicator of food contaminants.

79-1599. NCI, Bethesda, MD 20014 **Report on carcinogenesis bioassay of toxaphene.** *Am. Ind. Hyg. Assoc. J.* 40(5): A26, A28, A30, A32; 1979.

Toxaphene was tested under the Carcinogenesis Testing Program of the National Cancer Institute. In these tests, rats were given toxaphene in feed for an 80-wk period, then observed without dosage for an additional 28 to 30 wk and killed for examination and diagnosis. Mice also were given toxaphene for 80 wk and observed undosed for an additional 10 to 11 wk. Major tissues, major organs, and all growths or masses were given both gross and microscopic examination. Liver cancer was found in 98% of male mice and in 69% of female mice given high doses of toxaphene. In low-dose male mice 69%, and in low-dose female mice 10%, had liver cancer, compared to 8% of male control mice, and no liver cancer at all in female control mice. At high doses, 26% of male rats developed follicular-cell carcinoma or adenoma of the thyroid gland. In female rats given high doses of toxaphene, 17% developed thyroid tumors. It was concluded that, under test conditions, toxaphene was carcinogenic to male and female mice. The development of tumors in the thyroid glands of rats suggested that toxaphene was carcinogenic in rats as well.

79-1600. Stanton, H. C.; Albert, J. R.; Mersmann, H. J. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA 95352) **Studies on the pharmacology and safety of dichlorvos in pigs and pregnant sows.** *Am. J. Vet. Res.* 40(3): 315-320; 1979. (22 references)

Unformulated dichlorvos was lethal in 40-60-day-old swine when administered at dose level of 157 mg/kg. Formulated dichlorvos, however, was given at levels of 180-1000 mg/kg and did not result in death, due to the slow-releasing of the chemical in its formulated state. Organophosphate toxicosis was noted in animals receiving 320 or 1000 mg of the formulation. When young pigs were given the formulated DDVP at 1 to 16 mg/kg/day, the plasma and red blood cell cholinesterase activities were significantly depressed. No change was noted in the rate of body weight gain or feed consumption. When sows were fed formulated DDVP at 5 or 25 mg/kg/day during the last 30 days of gestation, a significant depression was noted in the acetylcholinesterase activity in those sows receiving the higher dosage level. No signs of organophosphate toxicosis were noted in these sows, and the reproductive performance of the treated dams was not altered by the chemical in any way.

79-1601. Nakas, J. P.; Litchfield, C. D. (Cent. Coast. & Environ. Studies, Mar. Sci. Div., Rutgers State Univ., New Brunswick, NJ 08903) **Evidence for the subcellular localization and specificity of chlordane inhibition in the marine bacterium** ***Aeromonas proteolytica.*** *Appl. Environ. Microbiol.* 37(3): 471-479; 1979. (37 references)

Sublethal levels (10-100 μg/ml) of the chlorinated insecticide chlordane (1,2,4,5,6,7,8,8- octachloro- 3a,4,7,7a-tetrahydro- 4,7-methanoindan) were introduced into the growth medium of the marine bacterium, *Aeromonas proteolytica.* Chlordane inhibited the synthesis of an extracellular endopeptidase by almost 40% but exhibited no such inhibition of the extracellular aminopeptidase also produced during the growth cycle. Studies with ^{14}C-labeled chlordane demonstrated that the insecticide was not biologically degraded under the test conditions used and that up to 75% of the recoverable chlordane was cell associated within 48 hr. Studies with uniformly labeled L- [^{14}C] valine and [2-^{14}C] uracil established that neither the transport nor the incorporation of these protein and ribonucleic acid precursors was inhibited by chlordane. Separation of the membrane fractions using isopycnic centifugation localized ^{14}C-labeled chlordane in the cytoplasmic membrane. Also, chlordane inhibited the membrane-bound adenosine 5′-triphosphatase while the soluble (released) form of this enzyme remained unaffected. These data indicate that chlordane resides in the cytoplasmic membrane and may cause specific alterations in membrane-associated activities. (Author abstract by permission)

79-1602. Vizethum, W.; Dahlmann, D.; Bolsen, K.; Goerz, G. (Hautklin., Univ. Duesseldorf, Duesseldorf, BRD) **Influence of chloroquine (Resochin) on hexachlorobenzene (HCB) induced porphyria of the rat.** *Arch. Dermatol. Res.* 264(1): 125; 1979.

Chloroquine, an effective drug for treating hepatic porphyria cutanea tarda in humans, was tested for its effects on HCB (hexachlorobenzene)-induced phorphyria in female adult Wistar rats. Rats were fed dietary HCB and after 60

days developed a hepatic porphyria confirmed by their increased excretion of urinary porphyrins (over 40 μg/animal/-day). Resochin (50 mg/kg/day) solution was applied by gastric intubation for a period of 6 wk. Other rats were kept on just the HCB-diet, others, just the Resochin, and a fourth group served as controls. At various intervals the urinary excretion of total porphyrins and porphyrin fractions were determined. At 1 and 6 wk after the start of Resochin treatment, rats from each group were sacrificed, and liver and skin porphyrins were measured by thin layer chromatography. In the HCB-fed rats given chloroquine, urinary porphyrins decreased to about 50% of levels found in HCB controls. This decrease lasted over the entire 6 wk of the experiment. Liver and skin porphyrin levels were also significantly decreased after 6 wk of chloroquine treatment. The predominant heme precursors in the liver were uro- and hepatoporphyrins; in the skin and urine, the copro- and protoporphyrins were more prevalent. These findings indicate that chloroquine treatment does stimulate a decrease in excess porphyrin production in rats with porphyria experimentally induced with HCB. [At the 6th annual meeting of the Working Group for Dermatologic Research.]

79-1603. Kanazawa, J.; Tomizawa, C. (Natl. Inst. Agric. Sci., Kita-ku, Tokyo 114, Japan) **Intake and excretion of 2,4,6-trichlorophenyl- 4′-nitrophenyl ether by topmouth gudgeon, *Pseudorasbora parva*.** *Arch. Environ. Contam. Toxicol.* 7(4): 397-407; 1978. (4 references)

When the freshwater fish, topmouth gudgeon, was exposed to continuous flow water containing 20 ppb of CNP (2,4,6- trichlorophenyl- 4′- nitrophenyl ether), CNP concentration in the fish body gradually increased and reached equilibrium after seven days. CNP concentration and bioconcentration ratio (partition coefficient between fish body and water) after 15 days were 25.3 ppm and 1109, respectively. When the fish was transferred into clean water, the CNP taken into the fish body was slowly excreted and decreased to 0.115 ppm after 30 days. In order to examine distribution and metabolism of CNP in the fish body, an exposure test to static water containing 20 and 100 ppb of ^{14}C-labeled CNP was conducted. The concentration of ^{14}C-CNP equivalent after seven days was decreased in the following order: kidney, viscera except kidney and liver, liver, head, muscle. More than 90% of the toluene-soluble fraction of the ^{14}C in each organ was the parent compound (CNP), and no significant decrease in the concentration of ^{14}C-CNP equivalent in each organ of the fish was found seven days after transfer into clean water. Consequently it appears that CNP is fairly persistent in the fish body. Several metabolites in the toluene-soluble fraction of fish and water were detected by TLC. Among these metabolites, only amino-CNP and *p*-nitrophenol were identified by GLC. (Author abstract by permission)

79-1604. Jarvinen, A. W.; Tyo, R. M. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **Toxicity to fathead minnows of endrin in food and water.** *Arch. Environ. Contam. Toxicol.* 7(4): 409-421; 1978. (29 references)

Fathead minnows (*Pimephales promelas*) were exposed during a partial chronic toxicity study to endrin concentrations in the water or food, or both, for 300 days encompassing reproduction. Tissue residues were analyzed at present intervals for first-generation fish, and were also determined for embryos, larvae at hatch, and 30-day progeny. Gas chromatographic and liquid scintillation techniques were used to monitor the contribution of endrin from each source. The food was clams that had accumulated ^{14}C-endrin when exposed to an endrin water concentration similar to that to which the fish were exposed. Higher endrin tissue residues were accumulated from the water than from food. Maximum concentration factors were 0.8 from the food and 13,000 from the water. Residues contributed by endrin in the food were additive to those from the water at all life stages. Endrin in the food (0.63 ppm) significantly reduced survival of the fathead minnows, and fish exposed to both endrin sources had lower survival than those exposed to either source alone. Endrin residues in embryos and larvae were highest and larval survival lowest for progeny of adults exposed to endrin in both food and water. Survival of 30-day progeny was significantly reduced at all test exposures (0.63 ppm in the food, water exposures of 0.14 and 0.25 ppb, and all combinations of food and water exposure). (Author abstract by permission)

79-1605. Goes, T. R.; Savage, E. P.; Boyd, W. L. (Inst. Rural Environ. Health, Dep. Microbiol., Colorado State Univ., Fort Collins, CO 80523) ***In vitro* inhibition of oral viridans streptococci by chlordane.** *Arch. Environ. Contam. Toxicol.* 7(4): 449-456; 1978. (26 references)

The viridans streptococci comprise a segment of the human oral flora which may play an important role in protecting the mouth from pathogenic bacterial infections. Human exposure to pesticide residues has been implicated as a possible contributing factor in upper respiratory and streptococcal infections. Chlordane, an organochlorine insecticide, was tested *in vitro* for its capacity to inhibit viridans streptococci growth. Possible antimicrobial effects on laboratory isolates of this bacterial group were studied, utilizing both disk inhibition techniques and turbidimetric analysis of bacterial cell density. The method of growth modification proved to be the more sensitive of the two procedures. Total inhibition of viridans streptococci reproduction was demonstrated at a chlordane concentration of 3.0 ppm. Further studies are necessary to determine whether chlordane inhibition of streptococcal growth *in vivo* can cause increases in bacterial infections of the oral cavity. (Author abstract by permission)

79-1606. Courtney, K. D. ; Putnam, J. P.; Andrews, J. E. (Health Eff. Res. Lab., Environ. Res. Cent., US EPA, Research Triangle Park, NC 27711) **Metabolic studies with TCDD (dioxin) treated rats.** *Arch. Environ. Contam. Toxicol.* 7(4): 385-396; 1978. (11 references)

Female Wistar rats treated orally with a single dose (100 μg/kg) of TCDD showed a biphasic decline in body

weight with a cessation of food and water consumption and urine production. The first phase started immediately after dosing and lasted 7 to 10 days. There was a cessation of food and water consumption with a loss of 15 to 30% of their body weight. During the next 4 to 6 days, rats ate and drank and regained 10 to 15% of their initial body weight. This was followed by the second phase in which food and water consumption decreased and there was another loss of body weight. Daily administration of water, electrolyte solution, or a balanced liquid diet did not alter or reverse the pattern of weight loss. Mitochondria from TCDD-treated rats were assayed and no effects were found on oxidative phosphorylation or ADP:O ratios. (Author abstract by permission)

79-1607. Folmar, L. C.; Sanders, H. O.; Julin, A. M. (Coastal Zone & Estuarine Div., Natl. Mar. Fish. Serv., Seattle, WA 98112) **Toxicity of the herbicide glyphosate and several of its formulations to fish and aquatic invertebrates.** *Arch. Environ. Contam. Toxicol.* 8(3): 269-278; 1979. (9 references)

Studies were initiated to determine the acute toxicity of technical grade glyphosphate (MON0573), the isopropylamine salt of glyphosate (MON0139), the formulated herbicide Roundup (MON02139), and the Roundup surfactant (MON0818) to four aquatic invertebrates and four fishes: daphnids (*Daphnia magna*), scuds (*Gammarus pseudolimnaeus*), midge larvae (*Chironomous plumosus*), mayfly nymphs (*Ephemerella walkeri*), Rainbow trout (*Salmo gairdneri*), fathead minnows (*Pimephales promelas*), chanel catfish (*Ictalurus punctatus*), and bluegills (*Lepomis macrochirus*). Acute toxicity for Roundup ranged from 2.3 mg/l (96 hr LC50, fathead minnow) to 43 mg/l (48 hr EC50, mature scuds). Toxicities of the surfactant were similar to those of the Roundup formulation. Technical glyphosate was considerably less toxic than Roundup or the surfactant; for midge larvae, the 48 hr EC50 was 55 mg/l and for rainbow trout, the 96 hr LC50 was 140 mg/l. Roundup was more toxic to rainbow trout and bluegills at the higher test temperatures, and at pH 7.5 than at pH 6.5. Toxicity did not increase at pH 8.5 or 9.5. Eyed eggs were the least sensitive life stage, but toxicity increased markedly as the fish entered the sac fry and early swim-up stages. No changes in fecundity or gonadosomatic index were observed in adult rainbow trout treated with the isopropylamine salt or Roundup up to 2.0 mg/l. The aging of Roundup test solutions for seven days did not reduce toxicity to midge larvae, rainbow trout or bluegills. In avoidance studies, rainbow trout did not avoid concentrations of the isopropylamine salt up to 10.0 mg/l; mayfly nymphs avoided 10.0 mg/l of Roundup, but not 1.0 mg/L. In a simulated field application, midge larvae avoided 2.0 mg/l of Roundup. Application of Roundup, at recommeded rates, along ditchbank areas of irrigation canals should not adversely affect resident populations of fish or invertebrates. However, spring applications in lentic situations, where dissolved oxygen levels are low or temperatures are elevated, could be hazardous to young-of-the-year-fishes. (Author abstract by permission)

79-1608. Neskovic, N.; Terzic, M.; Vitorovic, S. (INEP Dep. Pestic., Zemun Inst. Pharmacol. & Toxicol., Med. Fac., Beograd, Yugoslavia) **Akutna toksicnostkarbarila i propoksura u miseva prethodno tretiranih fenobarbitonom i SKF 525-A. [Acute toxicity of carbaryl and propoxur in mice previously treated with phenobarbital and SKF 525-A.]** *Arh. Hig. Rada Toksikol.* 29(3): 251-256; 1978. (8 references) (Serbo-Croatian)

The acute ip and sc toxicity of carbaryl and propoxur to male and female mice was studied. Phenobarbital (60 μg/kg) and SKF 525-A (50 μg/kg) were also given ip to groups of mice 24 hr and 1 hr, respectively, before carbaryl or propoxur dosing. Mice given carbaryl and propoxur by the ip route showed a higher mortality than mice given the compounds by a sc injection. Toxicity was greater in male mice than in female mice. The acute ip toxicity of carbaryl and propoxur was lowered by the administration of phenobarbital 24 hr before the administration of the pesticides. The administration of SKF 525-A 1 hr before carbaryl and propoxur dosing increased the acute ip toxicity of these compounds.

79-1609. Gustafsson, J. A.; Ingelman-Sundberg, M. (Dep. Chem., Karolinska Inst., S-10401 Stockholm 60, Sweden) **Changes in steroid hormone metabolism in rat liver microsomes following administration of 2,3,7,8- tetrachlorodibenzo- *p*-dioxin (TCDD).** *Biochem. Pharmacol.* 28(4): 497-499; 1979. (15 references)

Treatment of male and female rats with 4 x 20 μg/kg of 2,3,7,8- tetrachlorodibenzo- *p*-dioxin (TCDD) led to 2-3 fold increases in liver microsomal cytochrome P450 levels concomitantly with changes in liver microsomal metabolism of 4-androstene- 3,17-dione, 5α- androstane- 3α, 17β-diol and 4-pregnene- 3,20-dione. The changes were most pronounced in female rats where some hydroxylase activities increased 3-5 fold. It is suggested that the observed effects following TCDD administration may be related to the endocrine symptoms sometimes seen in patients exposed to this drug. (Author abstract by permission)

79-1610. Farquharson, D. (Biol. Dep., Illinois Inst. Technol., Chicago, IL 60616) **Conductance changes associated with a soman produced biphasic depolarization in *Electrophorus* electroplax.** *Biophys. J.* 21(3): 54A; 1978.

The effects of soman on membrane conductance were investigated by means of intracellular recording techniques and a voltage clamp. The depolarization of cell membranes by soman occurs in two steps. The first step involves a decrease in membrane conductance of potassium ion. The second effect is an increase in conductance similar to that caused by carbamylcholine. This decrease-increase conductance sequence corresponds to the observed slow-rapid depolarization action of soman on the cell membrane. These findings suggest that part of the potassium ion leak conductance is associated with acetylcholine receptor activity. The possibility that soman may react covalently with its binding site is given as an explanation of soman's multiple effects at the neuromuscular junction.

79-1611. Omann, G.; Lakowicz, J. R.; Hogen, D. (Freshwater Biol. Inst., Navarre, MN 55392) **Partitioning and diffusion of chlorinated hydrocarbon insecticides in membranes as studied by fluorescence quenching of carbozole labeled phospholipids.** *Biophys. J.* 21(3): 212A; 1978.

Phospholipids containing carbozole were synthesized as probes to determine the diffusion and partition coefficients of chlorinated hydrocarbons in membranes. Compounds such as DDT, DDE, lindane, mirex, carbon tetrachloride, and tetrachlorvinphos have been shown to be efficient dynamic quenchers of carbozole fluorescence. In dimyristoyl phosphotidyl choline vesicles, lindane partitions strongly into lipid bilayers with a partition coefficient of 9000 at 37°C. The partition coefficient in dioleoyl phosphatidylcholine vesicles at 25°C for lindane is 13000. In dipalmitoyl phosphatidylcholine vesicles at 25°C the partition coefficient for lindane is 4000. In dimyristoyl phosphatidylcholine vesicles at 37°C, the diffusion coefficient for lindane is 0.57 $\mu cm^2/s$. The uptake rates of lindane, tetrachlorvinphos and DDE from particulates into membranes have also been measured with the phospholipidcarbazole probes.

79-1612. Smejtek, P.; Paulis-Illangasekare, M.; Hsu, K. (Dep. Phys., Environ. Sci. Program, Portland State Univ., Portland, OR 97207) **Modification of ion transport in lipid bilayer membranes in the presence of herbicides, 2,4-dichlorophenoxyacetic acid.** *Biophys. J.* 25(2, Pt. 2): 180a; 1979.

It was found that 2,4-D is capable of increasing the rate of transport of positive ions, such as nonactin-K^+ complex (NON-K^+) and tetraphenylarsonium ($TPhAs^+$), and inhibiting transport of negatively charged tetraphenylborate ions ($TPhB^-$). The only membrane-permeable form of 2,4-D is the neutral form. A simple carrier model is used to explain the nonactin mediated transport of K^+. At levels of 0.3 m *M* 2,4-D enhances K^+ transport in lecithin-cholesterol and glycerol monooleate membranes so that it eventually becomes limited by the NON-K^+ recombination rate, singly, or in combination with the back diffusion of the unloaded nonactin. $TPhB^-$ blocking by 2,4-D is controlled by the inhibition of $TPhB^-$ diffusion across the membrane and not the decreased adsorption of $TPhB^-$ at the membrane surface. It was suggested that the electric potential of the membrane interior decreases in the presence of 2,4-D from the results of the kinetic parameters of NON-K^+ transport, $TPhAs^+$ membrane conductance, membrane current relaxation time constant, and the amount of translocated $TPhB^-$ during the relaxation process. Studies of the changes in electric potential difference across air/water, and air/lipid monolayer/water interfaces in the presence of 2,4-D support the data obtained from membrane conduction studies. It is believed that a layer of oriented 2,4-D molecules located on the hydrocarbon side of the membrane/water interfaces is responsible for the observed effects of this herbicide on ion transport in lipid bilayers. [At the 23rd annual meeting of the Biophysical Society.]

79-1613. David, D. (Lab. Biol. Anim., Univ. Clermont-Ferrand, Aubiere, France) **Gas chromatographic study of the rate of penetration of DDT into quail eggs at different stages of their development.** *Bull. Environ. Contam. Toxicol.* 21(3): 289-295; 1979. (7 references)

Quail eggs were immersed in a 0.5% aqueous suspension of commercial DDT prior to incubation. After the eggs were incubated for 0.5 hr at 14 days, the egg contents were homogenized and solvent extracted. A gas chromatograph with an electron capture detector was used to determine DDT levels. Measurable amounts of DDT were found in the control eggs (105 ng), control egg shells (0.022 ppm) and in the feed. In the treated eggs, a positive correlation existed between the number of hours of incubation and the DDT levels. After 0.5 hr, 13 hr, and 7.5 days of incubation, the DDT levels were 244, 564, and 1200 ng, respectively. It was determined that after one day of incubation, 11.4% of the *p,p'*-DDE, 48.3% of the *o,p'*-DDT, and 6.7% of the *p,p'*-DDT on the shells had penetrated the eggs.

79-1614. Stevens, J. T.; DiPasquale, L. C.; Farmer, J. D. (CIBA-GEIGY Corp., Greensboro, NC) **The acute inhalation toxicity of the technical grade organoarsenical herbicides, cacodylic acid and disodium methanearsonic acid; a route comparison.** *Bull. Environ. Contam. Toxicol.* 21(3): 304-311; 1979. (9 references)

Acute inhalation studies were carried out with two organoarsenical herbicides, cacodylic acid and disodium methanearsonic acid (DSMA). Adult Swiss-Webster mice and adult Sherman rats were exposed to up to 6.9 mg/l cacodylic acid or DSMA in air for 2 hr. Respiratory distress resulted from DSMA exposure, while cacodylic acid exposure produced respiratory distress, diarrhea, and decreased weight gain. The LD_{50} for cacodylic acid in female rats (the only animal which showed sufficient inhalation toxicity) was calculated to be 3.9 mg/l. The RD50 values for cacodylic acid and DSMA were 3.15 mg/l and 1.54 mg/l, respectively. Following ip and iv dosing, difficult breathing, loss of normal body temperature, irritation of the stomach lining, and blood in the intestine occurred. It is proposed that the irritancy potential of these chemicals may interfere with demonstratioin of their inhalation toxicity. Further studies using lower levels of exposure and longer exposure times are suggested.

79-1615. Zitko, V.; McLeese, D. W.; Metcalfe, C. D.; Carson, W. G. (Fish. & Environ. Sci. Resource Branch, Dep. Fish. & Environ. Biol. Stn., St. Andrews, New Brunswick EOG 2XO, Canada) **Toxicity of permethrin, decamethrin, and related pyrethroids to salmon and lobster.** *Bull. Environ. Contam. Toxicol.* 21(3): 338-343; 1979. (8 references)

The lethality of permethrin, decamethrin, NRDC 167, and NRDC 168S to juvenile Atlantic salmon (*Salmo salar*) and adult lobster (*Homarus americanus*) was determined. Each compound was tested at 5-6 concentrations. The lethal thresholds (96 hr) calculated for salmon ranged from 0.59 µg/l with DECIS 25 EC to 8.8 µg/l with permethrin NRDC 143). For lobster the lethal levels ranged from 0.003 µg/l with NRDC 1685 to 7.0 µg/l with permethrin (NRDC 143).

79-1616. Pittz, E. P.; Rourke, D.; Abraham, R.; Coulston, F. (Inst. Comp. & Hum. Toxicol., Albany Med. Coll., Albany, NY) **Alterations in hepatic microsomal proteins of mice administered mirex orally.** *Bull. Environ. Contam. Toxicol.* 21(3): 344-351; 1979. (26 references)

The changes in hepatic microsomal protein patterns after feeding mice 30 ppm mirex in their food for 12 wk were studied. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis was carried out on liver microsomal preparations. The livers from treated animals were found to be grossly enlarged, weighing more than twice as much as those of controls. Two regions of the gel contained areas that stained to a greater degree than the control. One region contained bands known to be associated with the cytochrome P-450 system. Spectrophotometric scans of some of the bands showed quantitative as well as qualitative differences between experimental and control preparations. The results are discussed in relation to previous observations on induction of hepatic microsomal enzymes by mirex.

79-1617. Mendoza, C. E.; Shields, J. B.; Laver, G. W. (Chem. Saf. Bur., Food Dir., Health Prot. Branch, Natl. Health & Welfare, Ottawa, Ontario, Canada K1A OL2 Canada) **Comparison of the porphyrinogenic activity of hexabromobenzene and hexachlorobenzene in primiparous Wistar rats.** *Bull. Environ. Contam. Toxicol.* 21(3): 358-364; 1979. (25 references)

The effects of hexabromobenzene (HBB) and hexachlorobenzene (HCB) on the liver porphyrin concentrations of female Wistar rats was studied. The rats were placed on diets containing 80 ppm HCB or HBB beginning two wk before mating until 35-66 days after weaning. There were no marked differences in external appearance, body weight, liver weight, gestation, or neonatal survival between experimental and control groups. The HBB group had significantly higher liver prophyrin levels than HCB or control groups. It was noted that some animals treated with HCB did not have elevated porphyrin levels, possibly due to genetic resistance or to remission of porphyria during pregnancy. The HBB residue level in liver was 4.82 ppm at the end of the experimental period, while the HCB level was 39.78 ppm.

79-1618. Wolfe, J. L.; Esher, R. J.; Robinson, K. M.; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., Mississippi State, MS) **Lethal and reproductive effects of dietary mirex and DDT on old-field mice, *Peromyscus polionotus*.** *Bull. Environ. Contam. Toxicol.* 21(3): 397-402; 1979. (9 references)

First generation labortory offspring of wild old-field mice were fed mirex or DDT at rates of 1.8 and 17.8 ppm in diet (0.004 mg and 0.036 in 15 mo). Mortality in the low dose mirex and in the DDT groups was near that of the controls. The high mirex dose significantly reduced litter production, while DDT did not affect reproduction. Mirex was found to be approximately four times as toxic as DDT. Mirex residues in the liver increased in proportion to the amount ingested, and were directly proportional to dietary concentration.

79-1619. Barsotti, D. A.; Abrahamson, L. J.; Allen, J. R. (Dep. Pathol., Univ. Wisconsin Med. Sch., Madison, WI) **Hormonal alterations in female rhesus monkeys fed a diet containing 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 463-469; 1979. (20 references)

Sixteen adult female rhesus monkeys were observed for six mo wherein menstrual cycles and blood hormone levels were evaluated. Afterwards 8 monkeys were fed a daily ration of 200 g of food containing 500 ppt 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), and the remaining 8 monkeys served as controls. Effects included anemia, severe pancytopenia, widespread hemorrhage related to the marked thrombocytopenia. Death occurred in 5 of the 8 experimental animals between the 7th and 12th mo of the experiment. Necropsy showed hypocellularity of the bone marrow and lymph nodes. Hypertrophy, hyperplasia and metaplasia of epithelium, bile and pancreatic ducts, salivary glands and palpebral conjunctivae were observed. Menstrual cycles were not altered during the first six mo of the study. Hormone levels (estradiol and progesterone) were altered, and reproductive difficulties, including inability to conceive and maintain pregnancies, arose.

79-1620. Murakami, M.; Fukami, J. (Inst. Phys. & Chem. Res., Wako-shi, Saitama 351, Japan) **Uptake of benzo(a)pyrene, carbaryl, DDT and parathion in cultured human cells: re-evaluation.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 478-482; 1979. (6 references)

Studies were performed to determine the uptake of benzo(a)pyrene, carbaryl, DDT and parathion by human embryonic lung diploid cells in culture. The extent of adsorption by the cell surface of the labeled compounds was examined. A large amount of DDT was taken up by cells, primarily associated with the lipid-rich surface membrane structure. Carbaryl and parathion were taken up to a smaller extent than was DDT, but these chemicals appeared to be more closely associated with cellular components such as proteins. The carcinogen, benzo(a)pyrene was found mainly in the insoluble residue. It is suggested that further studies be conducted on the incorporation and binding of chemicals to cellular constituents in cultured cell systems to aid in the study of the possible toxic action of the compounds in general.

79-1621. Ruddick, J. A.; Newsome, W. H. (Food Dir., Health Prot. Branch, New Res. Cent., Ottawa, Ont. K1A OL2, Canada) **A teratogenicity and tissue distribution study on dibromochloropropane in the rat.** *Bull. Environ., Contam. Toxicol.* 21(4-5): 483-487; 1979. (5 references)

Studies were performed on Wistar rats to determine the teratogenicity and fetotoxicity of dibromochloropropane (DBCP). Pregnant females were fed dosages of 0, 12.5, 25.0 or 50.0 mg DBCP/kg/day on days 6 through 15 of gestation. A gas chromatograph equipped with an electron capture detector was used to determine the DBCP levels in various tissues. DBCP was not teratogenic, but there was a toxic effect. Doses of 25.0 and 50.0 mg DBCP/kg resulted in lowered fetal and maternal weights. Except for fat samples, there was no

accumulation of DBCP in the fetus or in maternal tissues after ten days of treatment.

79-1622. Hattula, M. L.; Reunanen, H.; Arstila, A. U. (Dep. Chem. Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Toxicity of 4-chloro-*o*-cresol to rat: 1. Light microscopy and chemical observations.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 492-497; 1979. (7 references)

Male Wistar rats 2 to 3 mo old were used in a series of tests in which LD50 values and subchronic effects of 4-chloro-*o*-cresol (an MCPA metabolite) were determined. The LD50 for ip injection was determined to be 794 mg/kg, while the LD50 for oral administration was found to be 1194 mg/kg. The only abnormality following a subchronic dose of 100 mg/kg/day was necrosis of the small intestine, with extensive mononuclear infiltration in the underlying tissues. After acute doses of 1000 or 1100 mg/kg, inflammatory mononuclear infiltration was seen in many glomeruli of the kidney. At 1200 mg/kg, morphological changes were also observed in the liver and spleen. The chemical concentrations in the various organs following subchronic doses were relatively low, but at 1200 mg/kg, about 100 mg/kg was observed in the liver and kidney. In general, the greatest changes in histopathology were seen in organs in which the concentrations were the highest.

79-1623. Rivere, J. L.; Bach, J. (Inst. Natl. Rech. Agron., Lab. Phytopharm., CNRA, Versailles, France) **Aldrin epoxides in liver and small intestine of rat and Japanese quail.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 498-501; 1979. (15 references)

In vitro studies on aldrin metabolism were carried out on 2-mo-old Wistar rats from 6-mo-old Japanese quail. Enzymes were crudely extracted from liver, stomach, pancreas, spleen and intestine. Tissue extracts (containing enzymes) were incubated with buffers and aldrin. The metabolism of aldrin yielded dieldrin. Most of the epoxidation occured in the liver and small intestine. In both animals, the activity decreased from the proximal to the distal end of the small intestine. The results indicate that the intestinal microsomal system can be a major route of xenobiotic metabolism in quail.

79-1624. Verma, S. R.; Tyagi, A. K.; Bhatnagar, M. C.; Dalela, R. C. (Pollut. Relevant Res. Lab, Post-grad. Dep. Zool., D. A. V. Coll., Muzaffarnagar-251001 India) **Organophosphate poisoning to some fresh water teleosts-acetylcholinesterase inhibition.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 502-506; 1979. (14 references)

Organophosphate poisoning of the freshwater fish *Channa gacha* and *Cirrhina mrigala* was studied. The fish were treated with the pesticides Zolone (phosalone), Rogor (dimethoate), and malathion in amounts equal to 50, 33.3, and 20% of the TL50 values. The acetylcholinesterase activity in brain, liver and muscle tissue was determined as an indicator of toxicity. A progressive significant fall in enzyme activity was observed in all tissues, with increased pesticide concentration. The acetylcholinesterase activity recovered to some extent after seven days exposure.

79-1625. Glooschenko, V.; Holdrinet, M.; Lott, J. N. A.; Frank, R. (Fac. For., Univ. Toronto, Toronto, Ont., Canada) **Bioconcentration of chlordane by the green alga *Scenedesmus quadricauda*.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 515-520; 1979. (20 references)

Studies were performed in which *Scenedesmus quadricauda* cultures were treated with chlordane levels from 0.1 to 100 μg/l. One experiment was performed in which killed cells were exposed to 10 μg chlordane/l. A gas chromatograph equipped with an electron capture detector was used to determine chlordane levels. The living cells concentrated 6,000 to 15,000 times the original concentration within 24 hr. The bioconcentration factor for killed cells was 7,300. This indicates passive uptake of chlordane.

79-1626. Chandurkar, P. S.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI) **Metabolism of toxicant B and toxicant C of toxaphene in rats.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 539-547; 1979. (16 references)

A study was made of the chemical nature of the *in vitro* metabolites (2-endo,3,3,5,6-exo, 8,9,10,10- nonachlorobornane) of toxicant B and toxicant C of toxaphene. Incubates of rat liver supernatant and toxicants B and C were subject to dechlorination by diethyl ether and glacial acetic acid with zinc powder as catalyst. The dechlorination product was purified by thin-layer chromatography with heptane solvent, and identification was accomplished by proton magnetic resonance and mass spectroscopy. Chemical derivatization was carried out on polar metabolites of Toxicant C using separation by TLC and identification by gas-liquid chromatography. Derivatization of oxidation products of toxicant C was carried out using *o*-phenylenediamine followed by GLC. Results show that toxicant C is metabolized to one dechlorination product and five hydroxyl compounds, whereas toxicant B had no hydroxyl metabolites. These results suggest the importance of the oxidative processes in the metabolism of toxaphene.

79-1627. Spehar, R. L.; Veith, G. D.; DeFoe, D. L.; Bergstedt, B. V. (US EPA, Environ. Res. Lab. Duluth, Duluth, MN 55804) **Toxicity and bioaccumulation of hexachlorocyclopentadiene, hexachloronorbornadiene and heptachloronorbornene in larval and early juvenile fathead minnows, *Pinephales promelas*.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 576-583; 1979. (21 references)

Hexachlorocyclopentadiene and hexachloronorbornadiene, two synthesis intermediates of organochlorine pesticides, and hexachlorocyclopentadiene, a contaminant in the discharge of pesticide production plants were tested for their toxicity and bioaccumulation in larval and early juvenile fathead minnows. Lake Superior water was used in the tanks that housed the larvae, and the contaminants were added by

means of a multi-toxicant injection system. After the 30 day test period, the amount of contaminant recovered on a wet weight basis from whole fish was 98.0% for hexachloronorbornadiene, 93.0% for heptachloronorbornene, and 89.0% for hexachlorocyclopentadiene. The 96-hr LC50 values for hexachlorocyclopentadiene, hexachlorobornadiene, and heptachloronorbornene were 7.0, 188, and 85.6, respectively. The 30-day LC50 values for the above compounds in the same order were 6.7, 123, and 60.1 μg/l. Bioaccumulation factors for hexachloronorbornadiene and heptachloronorbornene were 6400 and 11,200, respectively, while that of hexachlorocyclopentadiene was less than 11. It is suggested that these findings may be used to predict the potential toxicity and residue forming capacity of toxic compounds in later life stages of fish to determine values that would be obtained during full life-cycle chronic tests.

79-1628. Sigmon, C. F. (Dep. Zool., Clemson Univ., Clemson, SC 29631) **Influence of 2,4-D and 2,4,5-T on life history characteristics of *Chironomus* (Diptera: Chironomidae).** *Bull. Environ. Contam. Toxicol.* 21(4-5): 596-599; 1979. (11 references)

Chironomus midges were collected from a sewage oxidation pond and acclimated to fresh water at 20, 25, or 30 °C. 2,4-D or 2,4,5-T were added at 1 or 3 ppm to the culture dishes and the mean mortality, pupation and emergence per culture dish were determined. The mean percentage of pupation per culture dish showed no significant differences among any of the dishes except for the ones exposed to 2,4-D at 30 °C. The pupation rate was slightly decreased for midges exposed to 2,4,5-T and the percent emergence for midges exposed to 3 ppm of this herbicide at 20°C was significantly lowered. The pupae emergence was also significantly decreased for midges in the dishes at 30° exposed to 2,4-D. Greater larval mortality was observed at both levels of 2,4-D and at 30°C for both herbicides, however, the differences in larval mortality were not statistically significant when compared to controls. Time elapsed from collection to pupation was significantly increased for midges exposed to 2,4,5-T at 20°C. These results show that the added stress of herbicides may be harmful to the life cycle of midges, as the temperatures used in the experiment approximate the water temperatures found in nature during the periods of the most extensive herbicide use.

79-1629. Eroschenko, V. P. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID 83843) **Changes in the reproductive performance of the Japanese quail fed Kepone in different calcium diets.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 631-638; 1979. (14 references)

Five wk old Japanese quail (*Coturnix corturnix japonica*) were fed a low calcium diet (0.5%) for 16 wk followed by a high calcium diet (3.5%) for another 16 wk. Another group of quail were fed the same low/high calcium diet supplemented with 200 ppm Kepone (chlordecone) for the same length of time. Egg weight, eggshell weight, and egg mortality rate of the birds were recorded along with weekly and monthly egg production, clutch size, and lag interval between laying of eggs. Production of intact eggs in the Kepone treated quails did not significantly lag behind that of controls until the 4th mo. The change-over to the high calcium diet at the end of the 4th mo caused less egg breakage in the control quails whereas egg breakage continued to increase even after this change-over in the quails receiving Kepone. Continued ingestion of Kepone caused a significant decrease in the mean clutch size as an increase in the lag intervals between egg laying. By the end of the 4th mo, the eggs of the Kepone treated quails were significantly heavier than those of controls, but the shells of the control eggs remained significantly heavier for most of the experiment. These findings are attributed to the delayed oviposition in treated quails which might cause the egg to pick up additional water before being deposited. Increased production of inferior eggs by Kepone treated quail may indicate an interference of the pesticide with calcium transport processes since more eggshell breakage occurred in this group even after the switch to the high calcium diet. The delay in oviposition after several mo on the Kepone diet was attributed to hormonal changes caused by the pesticide which are believed to interfere with the ovulation process.

79-1630. Walker, W. W.; Lowler, A. R.; Burke, W. D. (Gulf Coast Res. Lab., Ocean Springs, MS 39564) **Acute toxicity of 3-chloro- 4-methyl benzenamine hydrochloride to shrimp and crabs.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 643-651; 1979. (2 references)

Starling toxicant (CPTH, 3-chloro- 4-methyl benzenamine HCl) was tested for its acute toxicity to pink shrimp (*Penaeus duorarum*), white shrimp (*Penaeus setiferus*), and blue crab (*Callinectes sapidus*) in jars containing 50, 25, 10, 1.0, 0.1 and 0 ppm of the compound for shrimp, and 50, 25, 20, 15, 10, 1.0, 0.1, and 0 ppm for crabs. Observations were made of all species at 1, 4, 8, 12, 24, 48, 72, and 96 hr. Shrimp reacted to higher CPTH concentrations (50 and 25 ppm) by vigorous jumping and laying on their sides. Crabs also exhibited spastic movements, turning upside down, and curling of leg appendages. CPTH levels in the test water were determined by gas chromatography. The low recoveries of CPTH led to suspicions that the compound was being absorbed by the glass of the test vessel. A TLM of 10.8 ppm was calculated for shrimp, while for crabs this value was calculated at 16.0 ppm for CPTH. Although these studies show that CPTH is relatively toxic compared to other pesticides, the compound was still accepted for registration as an avicide to control herring and great-backed gulls on breeding islands along the northeastern coast of the United States.

79-1631. Meydani, M.; Post, G. (Colorado State Univ., Fort Collins, CO 80523) **Effect of sublethal concentration of malathion on coturnix quail.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 661-667; 1979. (7 references)

The effects of repeated exposure of coturnix quail (*Coturnix coturnix japonica*) to sublethal levels of malathion, and the recovery time for brain AChE were studied. Different

groups of birds received either 20, 40 or 75 mg of malathion (in corn oil) per day while controls received only the corn oil vehicle. Birds were sacrificed after 5, 10, 15 and 21 days of treatment and the brains were removed for analysis of AChE activity. Other birds from each group were observed for their physical ability on the performance of a flap test (how many times the bird could right itself after being placed on its back). After 21 days of malathion administration, the AChE activity was reduced to 31.7% of normal values in birds given 75 mg/day, 55.8% in birds given 40 mg/day, and 75.3% in birds given 20 mg/day. Results on the flap test showed that birds in the 20, 40, and 75 mg dose groups achieved values that were 65, 47, and 37% of normal values, respectively. A linear correlation was established for flap test data and activity of brain AChE after 21 days of malathion administration. These declines in physical ability due to treatment with malathion are discussed in relation to survival of wild bird populations that may be exposed to high levels of organophosphorus pesticides.

79-1632. Yockim, R. S.; Isensee, A. R.; Jones, G. E. (Pestic. Degradation Lab., ARS, USDA, Beltsville, MD 20705) **Distribution and toxicity of TCDD and 2,4,5-T in an aquatic model ecosystem.** *Chemosphere* 7(3): 215-220; 1978. (5 references)

A study undertaken to evaluate the toxicity of TCDD and the environmental fate of both TCDD and 2,4,5-T in an aquatic model ecosystem is described. A recirculating static model ecosystem was used in this study because it has the advantage of separating the fish from all other organisms via a screened partition. The soil for the ecosystem tanks was treated with either ring labeled ^{14}C-TCDD or carboxyl-labeled ^{14}C-2,4,5-T at the rate of 0.1 ppm. After the soils were flooded, 100 water fleas, 15 snails (*Helosoma* sp.), and 1.0 gram of algae (*O. cardiacum*) were placed in one chamber, and 15 mosquito fish were placed in the other chamber. Water and tissue samples were collected on days 1, 3, 7, 15, and 32. A second group of 15 mosquito fish were added to the TCDD ecosystem on day 15, after the first group had died. After 32 days, all remaining organisms were harvested and analyzed. TCDD was found to bioaccumulate to environmentally hazardous levels, but 2,4,5-T showed much lower bioaccumulation rates. Toxicity was observed in the TCDD ecosystems, but not in the 2,4,5-T ecosystem. The persistence of TCDD in the aquatic environment was also monitored by periodically sampling the soil sediment.

79-1633. McLeese, D. W.; Zitko, V.; Peterson, M. R. (Fish. Environ. Sci., Biol. Stn., Fish. & Oceans Canada, St. Andrews, New Brunswick, Canada) **Structure-lethality relationships for phenols, anilines and other aromatic compounds in shrimp and clams.** *Chemosphere* 8(2): 53-57; 1979. (6 references)

Shrimp (*Crangon septemspinosa*) and soft-shelled clams (*Mya arenaria*) were exposed to lethal doses of 45 aromatic compounds. Lethality tests of 96-hr duration were carried out in 4 l of aerated sea water at 10°C at various compound concentrations. Chemical concentrations were measured by UV spectrometry at various time intervals: 0, 2, 4, 6, 12, 24, and 48 hr. LT50 (time at 50% mortality) at a particular compound concentration was calculated from a plot of percent mortality vs. test concentration. Lethal thresholds were obtained for 10 compounds in clams, and 40 chemicals in shrimp. Quantitative structure-activtity relationships (QSAR) of phenols and anilines generally yielded good correlation (correlation coefficient 0.778-0.972). Lethal thresholds for *Crangon* were predictable with a median deviation by a factor of 2-3. In all applicable QSARs, lethal thresholds were underestimated by more than an order of magnitude for hydroquinone, 4,6- dinitro- 2-*sec*- butyl-phenol, fenitrothion, amiocarb, and carbaryl.

79-1634. McLeese, D. W.; Metcalfe, C. D. (Fish. Environ. Sci., Biol. Stn., Fish. & Oceans Canada, St. Andrews, New Brunswick, Canada) **Toxicity of mixtures of phosphamidon and methidathion to lobsters (*Homarus americanus*).** *Chemosphere* 8(2): 59-62; 1979. (5 references)

Lobsters, 450 g each, were exposed to methidathion or phosphamidon alone and in combination at 20°C in 30 l seawater for at least 96 hr. Lethal threshold and 48 hr LC50 values for phosphamidon alone were found to be 18 and 107 μg/l, respectively; corresponding values of 10 and 14, respectively, were obtained for methidathion. For the tests with mixtures, the compounds were added at concentrations totaling approximately 1.0, 0.5, and 0.25 of the total 48 hr toxic unit in ratios of 1:1.5, 1:4.4, and 2:1, phosphamidon:methidathion, respectively. Indices of additive toxicity and magnification factor were calculated from LC50 values. The largest magnification factor of additive toxicity was obtained for the 1:1.5 ratio where phosphamidon and methidathion contributed almost equally to the total toxicity.

79-1635. Koegel, W.; Mueller, W. F.; Coulston, F.; Korte, F. (Inst. Chem., Tech. Univ. Muenchen, D-8050 Freising-Weihenstephan, BRD) **Uptake, body distribution, storage, and excretion of pentachloronitrobenzene ^{14}C in rhesus monkeys.** *Chemosphere* 8(2): 89-95; 1979. (4 references)

Male and female rhesus monkeys received varying amounts of ^{14}C-PCNB (quintozene) from 1 to 70 days. For determination of uptake, distribution and excretion of PCNB, samples of blood, urine, and feces were collected, and autopsies were performed on sacrificed animals. Absorption of a single 0.5 mg/kg oral dose was rapid; a first maximum concentration was reached after only 1.5 hr. Of the labeled material, 28.5% was excreted by the kidneys after 24 hr. Highest tissue concentrations following a single dose were found in the bile (275.0 and 14.4 ppm after 24 and 48 hr, respectively). A single oral dose of 91 mg/kg administered by gastric intubation was eliminated slowly (50% in 4 days), indicating that a large quantity of PCNB was stored in the fat. Seventy-day chronic feeding of 2 ppm PCNB showed that an equilibrium between uptake and excretion is reached within 30-40 days.

79-1636. Koegel, W.; Mueller, W. F.; Coulston, F.; Korte, F. (Inst. Chem., Tech. Univ. Muenchen, D-8050 Freising-Weihenstephan, BRD) **Biotransformation of pentachloronitrobenzene- ^{14}C in rhesus monkeys after single and chronic oral administration.** *Chemosphere* 8(2): 97-105; 1979. (7 references)

The metabolic conversion of pentachloronitrobenzene (PCNB; quintozene) in non-human primates is described. Male and female rhesus monkies (*Macaca mulatta*) were given single oral doses of 2 or 91 mg/kg ^{14}C-PCNB, or given 2 ppm PCNB in their daily diets for 71 days. Levels of radioactivity were determined in blood, tissue, urine, and fecal samples. PCNB metabolites were determined by radio-thin layer chromatography and GLC-MS. Two major pathways of biotransformation of PCNB were: the reduction of the nitro-moiety to the corresponding aniline, and the cleavage of the C-N bond via conjugation with sulfur-containing amino acids. Pentachloroaniline, pentachlorophenol, pentachlorobenzene, pentachlorothioanisole, and bis- methyl- tetrachlorobenzene were always present as major metabolites.

79-1637. Vesely, D. L.; Watson, B.; Levey, G. S. (Dep. Med., Univ. Arkansas Med. Sci., Little Rock, AR) **Activation of guanylate cyclase by paraquat: possible role of superoxide anion.** *Clin. Res.* 27(2): 238A; 1979.

The herbicide paraquat is known to increase the rate of superoxide anion production which is countered by an increase in superoxide dismutase. It is also believed that the activation of guanylate cyclase by various substances is due to their conversion to nitrous oxide or hydroxyl radical. A study was undertaken to see if there might be an alternate pathway of guanylate cyclase activation that would eliminate the need for hydroxyl radical formation. Paraquat increased guanylate cyclase activity two fold at levels as low as 0.005 m*M*, an enhancement that was not blocked by cyanide which normally inhibits superoxide dismutase. This suggests that the activation process is probably not dependent on superoxide dismutase which is responsible for the conversion of the superoxide anion to hydrogen peroxide, which in turn is converted to the hydroxyl radical. It was shown that hydrogen peroxide was probably not involved in the activation process, by the addition of catalase which had no effect on the activation process. The addition of butylated hydroxytoluene, a scavenger of hydroxyl radicals, also had no effect on the activation of guanylate cyclase by paraquat. Only the superoxide dismutase inhibited the activation process indicating that probably the superoxide ion itself activates the guanylate cyclase enzyme circumventing any need for formation of hydroxyl radicals. [At the 36th Annual National Meeting of the American Federation for Clinical Research.]

79-1638. Reuber, M. D. (Frederick Cancer Res. Cent., NCI, Frederick, MD 21701) **Carcinomas and other lesions of the liver in mice ingesting organochlorine pesticides.** *Clin. Toxicol.* 13(2): 231-256; 1978. (78 references)

Carcinomas of the liver were readily induced in male and female mice given organochlorine pesticides orally. The carcinomas were predominantly hepatocellular, with a few being cholangiocellular, and varied from well differentiated to poorly differentiated to undifferentiated. They are capable of invading, metastasizing, and killing the mice. Hemangiosarcomas, leimyosarcomas, and reticulum cell sarcomas were also occasionally seen in mice receiving these chemicals. Hepatic vein thrombosis and hepatic necrosis was observed in some mice. (Author abstract by permission)

79-1639. Rodnitzky, R. L.; Levin, H. S.; Morgan, D. P. (Dep. Neurol., Univ. Hosp., Iowa City, IA 52242) **Effects of ingested parathion on neurobehavioral functions.** *Clin. Toxicol.* 13(3): 347-359; 1978. (26 references)

The effects of parathion ingestion on volunteer subjects was investigated. Two male faculty members completed four 5-day periods of parathion ingestion separated by 1-8 wk intervals. In this study, the subjects ingested small doses of parathion, and then were evaluated by a battery of neurobehavioral tests. The tests included measures of memory, vigilance, information processing, language, proprioceptive performance, anxiety level, and depression. Vigilance was measured by the self-paced EX test, and anxiety was measured by the Taylor Manifest Anxiety test. The subjects own preexposure performances were used as controls, so that even subtle neurobehavioral changes could be detected. Chronic ingestion of parathion given in low doses was found to have no significant effect on cognitive and psychomotor performance.

79-1640. Tu, C. M. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Effects of insecticides on population of microflora, nitrification and respiration in soil.** *Commun. Soil Sci. Plant Anal.* 9(7): 629-636; 1978. (12 references)

Leptophos, phorate, terbufos, WL24073, carbofuran, streptomycin, maneb, and the nitrogen stabilizer, nitrapyrin, were applied to sandy loam soil at 5 μg AI/g soil for the insecticides, and 100 μg/g for nitrapyrin, maneb, and streptomycin. Samples were incubated for 8 wk at 28°C and a moisture content of 60%. Microbial populations were counted at 1, 2, 4, 6, and 8 wk using the dilution plate method. Bacteria and actinomycetes were counted on sodium albuminate agar plates, and rose bengal-streptomycin agar was used for fungi. Nitrificaton of ammonium-nitrogen from soil organic matter and $(NH_4)_2SO_4$-N was determined by the soil perfusion method. Perfusates were analyzed every other wk for nitrite and nitrate-nitrogen by the diazotization and phenol disulfonic acid methods. Oxygen consumption of the soil cultures was determined by a Gilson differential respirometer. No significant effects on fungal populations were observed with any of the treatments until the 6th wk of treatment when populations were significantly depressed by phorate. Bacterial populations were significantly increased by WL 24073 and leptophos. Nitrapyrin treatment significantly reduced nitrification for 4 wk, but this process was recovered by the 6th wk. Microbial respiration was stimulated by phorate. Overall the

four experimental insecticides had short-lived effects on the processes and numbers of soil microorganisms, and therefore these compounds are believed to be safe for use.

79-1641. Stoytchev, T.; Yanev, S.; Micheva, M.; Krustanova, M. (Inst. Physiol., Bulg. Acad. Sci., Sofia, Bulgaria) **Protective effect of the reversible inhibitors of cholinesterase upon poisoning with organic phosphorus compounds.** *C. R. Acad. Bulg. Sci.* 31(12): 1649-1652; 1978. (9 references)

The effect of physostigmine and neostigmine on the toxicity of diisopropyl fluorophosphate (DFP) was studied in mice. Following a dose of DFP (5.7 mg/kg) alone or in combination with physostigmine or neostigmine, survival time, clinical patterns, death rate, and cholinesterase activity were determined. Animals receiving DFP alone died in an average of 12.8 min. Physostigmine injections 10 to 60 min prior to DFP poisoning resulted in 100% survival. Neostigmine produced no such effect. Cholinesterase activity was completely inhibited by DFP, whereas both physostigmine and neostigmine produced 20-40% inhibition at the 20th or 28th min after DFP injection.

79-1642. Stone, L. C. (Univ. Cincinnati, Cincinnati, OH) **Effects of the herbicide 2,4-dichlorophenyl- *p*-nitrophenyl ether (TOK) on lung maturation.** *Diss. Abstr. Int. B.* 39(9): 4273; 1979.

The herbicide 2,4-dichlorophenyl- *p*-nitrophenyl ether (TOK, nitrofen) retards lung maturation in the rat fetus. Newborn pups exposed *in utero* to TOK on days 8 through 18 of gestation exhibit labored breathing, become cyanotic and expire within 1-2 hr following birth. The possibility that TOK exerts a direct effect on Type II alveolar cells, the cellular site of surfactant synthesis, was investigated by measuring a number of parameters associated with pulmonary lipid surfactant synthesis. No significant treatment effects were found in measurements of lung tissue phospholipid levels, lung choline phosphotransferase activity, lecithin synthesis from ^{14}C-choline in lung slices and surface tension measurements in saline extracts from minced lung tissue. The possible interference of TOK in glucocorticoid stimulation of lung maturation was evaluated by co-administering the potent synthetic glucocorticoid dexamethasone with TOK. Dexamethasone did not protect the fetus from TOK-induced toxicity. From these data, it is concluded that TOK does not inhibit surfactant syunthesis but rather has a generalized inhibitory effect on lung maturation. Although the actual mechanism for the TOK-induced alteration in the developing fetal lung remains unknown, this research indicates that there are additional, and as yet unknown factors, besides surfactant, which govern fetal lung development. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 7904769)

79-1643. Baker, S. R. (Iowa State Univ., Ames, IA) **Metabolism of parathion in perfused whole pig livers.** *Diss. Abstr. Int. B* 39(9): 4297; 1979.

The uptake, metabolism and kinetic behavior of parathion were examined in isolated, blood-perfused whole pig liver preparations. First pass hepatic venous outflow profiles of parathion and ^{51}Cr-labeled red blood cells followed existing transsinusoidal exchange principles. First pass absorption values for parathion input concentrations of 33.9, 41.0, and 52.8 ppm in the perfusate blood were 97.8, 84.5, and 68.7%, respectively. Second pass values altered the total absorption of the 41.0 and 52.8 ppm levels to 81.7 and 73.0%. Disappearance of ^{14}C-parathion from blood perfusate was rapid subsequent to first pass, and by 60 min post-addition to the system was reduced to less than 12% of initial input parathion concentrations of 40.2-52.8 ppm. Paraoxon was not detected in two of four trials, and in the other two trials ranged from 2.5% to 9.5% of the added parathion, between 20 min and 60 min post-addition to the system. Accountability of ^{14}C at 60 min revealed 39.9% in whole blood (31.8% of which was in plasma), 18.9% in liver and less than 0.6% in 0-60 min bile. Parathion levels in liver and blood averaged 0.61% and 3.26%, respectively in four trials; paraoxon levels in liver and blood were 3.22% and 4.32%. No *p*-nitrophenol was detected in liver or blood at any time. Line-weaver-Burk plots of parathion conversion to paraoxon were skewed, precluding the determination of kinetic constants for that metabolic reaction. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 7903955)

79-1644. Jameson, H. D. (Author address not given) **EEG signs in methylbromide intoxication.** *Electroencephalogr. Clin. Neurophysiol.* 46(1): 2P-3P; 1979.

Three cases of exposure to the fumigant methyl bromide are described. The 6-yr-old boy of the household displayed convulsions and became comatose. His initial EEG showed irregular waves of 1-2.5 Hz 25 to 75 μV rhythmic activity of 4 Hz with multifocal spikes. After 3 wk his condition improved and the EEG returned to normal. The grandmother showed signs of confusion, accompanied by nausea, vomiting, seizures, and coma. Upon admission to the hospital the EEG showed persistent rhythmic 9 Hz 50 μV activity with semi-rhythmic synchronous 2-4 Hz 100 μV waves. During the 10 days of seizures and coma the serial EEG activity showed semi-rhythmic 5-7 Hz 25 to 100 μV, the frontal-central was 10 Hz 25 μV rhythm and semi-rhythmic synchronous 2-5 Hz 100 μV waves. There were no spindles or spikes, and 2 yr after the incident the patient had a normal EEG. The grandfather had a minor definite illness consisting of nausea and confusion. His awake EEG was initially irregular with 1-4 Hz to 50 μV activity, but the sleep EEG was normal. Ten days later the awake EEG returned to normal. [At the 30th annual meeting of the Southern EEG Society.]

79-1645. Mulla, M. S.; Navvab-Gojrati, H. A.; Darwazeh, H. A. (Dep. Entomol., Univ. California, Riverside CA 92521) **Toxicity of mosquito larvicidal pyrethroids to four species of freshwater fishes.** *Environ. Entomol.* 7(3): 428-430; 1978. (8 references)

Six new synthetic pyrethroids, some of which possess exceptionally high mosquito larvicidal activity, were studied for their toxicity against 4 species of game and predatory fish. The various species showed different levels of susceptibility to the various compounds. As a whole most of the pyrethroids showed a good margin of safety (derived from the ratio of LC50-90 fish to LC50-90 mosquito larvae) to the test fish species. It is very likely that the pyrethroids with high margins of safety can be utilized in larvicidal programs without marked acute effects on fish fauna, while others possessing low margin of safety will pose a serious hazard to fish in aquatic habitats treated with these materials. (Author abstract by permission)

79-1646. Epler, J. L.; Larimer, F. W.; Rao, T. K.; Nix, C. E.; Ho, T. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN) **Energy-related pollutants in the environment: use of short-term tests for mutagenicity in the isolation and identification of biohazards.** *Environ. Health Perspect.* 27: 11-20; 1978. (41 references)

A comprehensive study begun on the potential genetic hazards of energy-producing systems is described. Samples of compounds known to be produced by energy generation are tested (including some pesticides), along with actual samples of unknown content. A "tier system" was set up for the testing. The first tier, which is a screening process to determine compounds that will require further testing, consists of testing for mutagenicity in microbial systems, such as *Salmonella typhimurium, Escherichia coli,* and yeast. In tier II, human leukocytes, mammalian cells and *Drosophila* are used for testing. Higher tiers involve risk assessment in mammalian assays, using mice. As an example of the system, test results on mutagenicity of nitropiperdine are given. Screening processes for complex mixtures are described, and results of mutagenicity testing on coal fraction constituents and synthetic crude oils are given.

79-1647. Menn, J. J. (Stauffer Chem. Co., Mountain View Res. Cent., Biochem. Dep., Mountain View, CA) **Comparative aspects of pesticide metabolism in plants and animals.** *Environ. Health Perspect.* 27: 113-124; 1978. (69 references)

A review of current research on the biotransformation of pesticide chemicals in plants and animals is presented. The biotransformation products are similar or the same in plants and animals, but there are important quantitative differences. The various sites of metabolizing enzymes are listed, as well as the major biotransformation reactions. Most of the reactions are oxidative and mediated by microsomal enzymes, but reduction and nonmicrosomal transformation play a key role. Metabolic transformations in selected pesticides are described. Dechlorination of DDT, desulfuration of organophosphorus ester insecticides, and hydrolysis of many pesticides are among the examples detailed.

79-1648. Fishbein, L. (Natl. Cent. Toxicol. Res., Jefferson, AR) **Overview of potential mutagenic problems posed by some pesticides and their trace impurities.** *Environ. Health Perspect.* 27: 125-131; 1978. (53 references)

The scope of pesticide use and the populations at potential risk are discussed in this review. It is estimated that 1.6 billion pounds of pesticide are produced annually in the United States, utilizing approximately 1400 active ingredients. The importance of knowing the structural features of pesticides, their degradation and transformation products, and their impurities is emphasized. Current knowledge on the mutagenic and/or carcinogenic effects of certain pesticides is presented. Among the pesticides considered are: DDT, hexachlorobenzene, 2,4,5-T, pentachlorophenol (PCP), various herbicide precursors of nitrosamines and nitroso derivatives, and halo-unsaturated pesticides.

79-1649. Siegers, C. P. (Abt. Toxikol., Med. Hochsch., Luebeck, BRD) **Influence of dithiocarb on the biliary excretion of paracetamol and bilirubin in rats.** *Experientia* 34(10): 1318-1319; 1978. (3 references)

The effects of dithiocarb on the biliary excretion of paracetamol and bilirubin was studied in the cannulated bile ducts of male rats. Bile sampling was done at 1 hr intervals over an 8 hr period after the oral application of 1 g/kg of paracetamol. Dithiocarb was given ip at 100 mg/kg. Gas chromatography was used to determine levels of free and conjugated paracetamol. Bilirubin was injected iv in a sodium hydroxide solution and bile sampling was done at 0.5 hr intervals for a 3 hr period. Bilirubin was determined with sulfanilic acid. The base line bile flow in both experimental groups did not significantly differ from that of controls. Paracetamol almost doubled bile flow over the course of the observations. Approximately 12% of the applied dose of paracetamol was eliminated via the bile after 8 hr. The biliary excretion of conjugated paracetamol was decreased by dithiocarb, while free paracetamol excretion was not affected. The effects of dithiocarb on excretion of an exogenous bilirubin load was studied in separate experiments. After 3 hr, nearly 18 mg/kg of a 25 mg/kg dose of bilirubin was excreted via the bile of which 12 mg/kg were conjugated with glucuronic acid. An ip dose of dithiocarb (100 mg/kg) inhibited biliary elimination of conjugated bilirubin which led to a reduction of the total bilirubin. The bilirubin load had no effects on bile flow, nor did the combined bilirubin-dithiocarb administration. These findings suggest that the ability of dithiocarb to reduce biliary excretion of conjugated paracetamol is due to the inhibition of conjugation. It is suggested that dithiocarb is conjugated to glucuronic acid in the liver and is excreted as *S*-glucuronide.

79-1650. Jauch, D. (Inst. Biol. III Univ., Lehrstuhl Zoolphysiol., Abt. Physiol. Oekol., D-7400 Tubingen, BRD) **Gill lesions in Cichlid fishes after intoxication with the insecticide fenthion.** *Experientia* 35(3): 371-372; 1979. (13 references)

Fish of the species *Herotilapia multispinosa* were exposed in aerated glass containers to levels of fenthion of 4.4, 5.0, and 5.5 mg/l for 48 hr and 7.2 mg/l for 72 hr. Fish of

the species *Tilapia leucosticta* were exposed to 2.8, 5.5, 7.2, and 8.3 mg/l of fenthion for 24 or 96 hr. At the end of the experiment, fish were killed and examined for abnormalities of the gills. In *H. multispinosa*, hyperplasia and separation of the respiratory epithelium, lamellar telangiectases and thrombosis were found. Surviving fish regenerated the lamellar epithelium after recovery periods in fresh water of several days. No telangiectasis was observed in *T. leucosticta*, however, all secondary lamellae were fused due to severe gill epithelium hyperplasia. Lethality data from the experiments also show that *T. leucosticta* was less susceptible to the toxic action of fenthion. These studies in two genera of Cichlid fish illustrate that the histopathological patterns of insecticide poisoning are nonspecific and may vary from species to species.

79-1651. Nagai, K.; Nakamura, T.; Koyama, J. (Dep. Hyg. Chem., Fac. Pharm. Sci., Hokkaido Univ., Sapporo 060, Japan) **Characterization of macrophage proteases involved in the ingestion of antigen-antibody complexes by the use of protease inhibitors.** *FEBS Lett.* 92(2): 299-302; 1978. (19 references)

In order to characterize the serine esterases involved in the inhibition of the ingestion of antigen-antibody complexes, DFP, 1-L-tosylamido-2-phenylethyl-chloro-methylketone (TPCK), and chrymostatin were tested in cultures of sensitized sheep erythrocytes exposed to macrophages. Sensitized erythrocytes were incubated with macrophages to which the three protease inhibitors were added 15 min before the initiation of phagocytosis. The numbers of ingested sensitized sheep erythrocytes were counted and compared with control plates to determine effects on phagocytosis. Anti-phagocytic effects increased as the concentration of each inhibitor was increased. TPCK, antipain, pepstatin, elastatinal, and leupeptin did not significantly alter the ingestive activity of the macrophages, however at the same concentrations these compounds successfully inhibited trypsin, papain, pepsoin, elastase, and trypsin. Macrophages were also pretreated with TPCK and chymostatin to see if this had any effect on ingestive activity. Inhibition by TPCK was found to be less than that if the compound was applied at the time of active phagocytosis. Pretreatment with chymostatin caused no inhibition. This finding was attributed to the reversibility of inhibition of chymotrypsin-like proteases by chymostatin, while phosphorylation or alkylation of the enzymes by DFP and TPCK is irreversible.

79-1652. Nieweg, H. O.; van der Schans, G. S. (Div. Hematol., Dep. Med., Univ. Groningen, Groningen, The Netherlands) **Drug-induced panmyelopathy (aplastic anaemia).** *Haematol. Bluttransfus.* 21: 171-178; 1978. (27 references)

Current knowledge on the induction of aplastic anemia by drugs is reviewed. Some of the drugs thought to be responsible are listed. They include chloramphenicol, aspirin, sulphonamides, anti-thyroid drugs, and anti-rheumatic drugs. The insecticides DDT and lindane have also been shown to be harmful to the bone marrow. It is suggested that genetic factors may be involved, and there is increasing evidence for an immunological mechanism of bone marrow damage. It is believed that the various drugs in queston affect the outer membrane of blood cells, making it antigenic or increasing its susceptibility to immune injury.

79-1653. Touitou, Y.; Bogdan, A. (Serv. Biochim., Fac. Med. Pitie-Salpetriere 91, F-75634 Paris Cedex 13, France) **Influences of *o,p'*-DDD, *o,p'*-DDE and solubilization procedures on the *in vitro* biosynthesis of 18-hydroxycorticosterone and aldosterone by sheep adrenals.** *Int. J. Biochem.* 9(9): 691-695; 1978. (7 references)

Sheep adrenal homogenates were exposed to concentrations of *o,p'*-DDD (TDE) and *o,p'*-DDE ranging from 0.01 *M* to 4 times that amount. These concentrations were found to inhibit the synthesis of 18-hydroxycorticosterone from deoxycorticosterone or corticosterone. The use of organic solvents with the *o,p'*-DDD did not improve its inhibitory powers, with the possible exception of ethanol which gave only a slight response. The sex of the animal had no effect on the inhibitory process.

79-1654. Abraham, Z.; Edery, H. (Isr. Inst. Biol. Res., Ness-Ziona & Sackler Sch. Med., Tel Aviv Univ., Tel Aviv, Israel) **Cholinesterase inhibition as modifier of calcium availability at the rat diaphragm neuromuscular junction.** *Isr. J. Med. Sci.* 14(4): 497; 1978. (2 references)

The antidotal action of 3-chloro-2,5,6-trimethyl sodium benzoate (U-23223) and 9-anthroic acid (ANCA) by competition with calcium ions was studied in isolated rat hemidiaphragms kept in standard Ringer solution. Twitches were induced by stimulating the phrenic nerve. Increased twitch height was achieved after the addition of 50 μM ANCA or 0.1 m*M* U-23223 and one of the following treatments: soman (50 μM), suspension of the muscle in low-calcium Ringer solution, or preincubation with the calcium antagonist, D-600 (10 μM). The activity of the above mentioned solutions was decreased by the addition of A 23187. These findings illustrate the inverse dependence of ANCA and U-23223 on the calcium ions in the medium. It is believed that cholinesterase inhibition interferes with calcium availability at the endplate in the same way that lowering the cation in the medium or preincubating the muscle tissue with D-600 does. It was also confirmed that ANCA enhances twitch height in low-chloride Ringer solution, but not to the extent that it does in low-calcium medium.

79-1655. Mallipudi, N. M.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Toxicity of *N*-sulfenylated derivatives of insecticidal methylcarbamate esters to the honeybee.** *J. Agric. Food Chem.* 27(2): 261-265; 1979. (17 references)

A series of *N*-arylsulfenyl, *N*-alkylsulfenyl, and *N*-aminosulfenyl derivatives of several commercial insecticidal methylcarbamate esters was examined for toxicity to honey-

bees and houseflies. All but one of the 34 compounds showed high toxicity to the honeybee. 2-Isopropoxyphenyl *N*-methyl-*N*-(2-methyl-4-*tert*-butylphenylsulfenyl) carbamate with a honeybee LD50 > 800 μg/g was more than 33 times less toxic to honeybees than to houseflies (LD50 24.5 μg/g). In comparison, the parent carbamate, propoxur, was more toxic to the honeybee (LD50 4.5 μg/g) than to the housefly (LD50 24.0 μg/g). The toxicity of 2-isopropoxyphenyl *N*-methyl-*N*-(2-methyl-4- *tert*-butylphenylsulfenyl) carbamate to the honeybee was synergized more than 18-fold by piperonyl butoxide. Compared to propoxur, the *N*-aminosulfenyl derivatives of propoxur were generally of equal toxicity to houseflies, substantially more toxic to mosquito larvae, and much less toxic to mice. (Author abstract reprinted by permission of the American Chemical Society)

79-1656. Foster, T. S.; Khan, S. U.; Akhtar, M. H. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ont. K1A OC6, Canada) **Metabolism of atrazine by the soluble fracion (105000 g) from chicken liver homogenates.** *J. Agric. Food Chem.* 27(2): 300-302; 1979. (10 references)

The soluble fraction (105000 g) from chicken liver homogenates contains a heat-labile, glutathione-dependent enzyme(s) which metabolizes atrazine in *in vitro* incubations. This is accomplished by conjugation with glutathione and subsequent hydrolysis and partial N-dealkylation to the hydroxy and dealkylated analogues. Evidence is also presented for some dechlorination of the chloro-*s*-triazine to hydroxy-*s*-triazine. However, enzymatic hydrolysis of atrazine is the predominant reaction in the soluble fraction from chicken liver homogenates. (Author abstract reprinted by permission of the American Chemical Society)

79-1657. Brocker, E. R.; Schlatter, C. (Inst. Toxicol., Swiss Fed. Inst. Technol., CH-8603 Schwerzenbach, Switzerland) **Influence of some cations on the intestinal absorption of maneb.** *J. Agric. Food Chem.* 27(29): 303-306; 1979. (22 references)

Orally administered maneb [polymeric manganese ethylenebis (dithiocarbamate)] is rapidly degraded in the intestine of rats, excretion being almost complete within 3 days. After administration of ^{14}C-maneb to female rats, about 50, 40, and 1% of ^{14}C activity was excreted in urine, feces, and exhaled air, respectively. Studies with ^{54}Mn maneb showed that no absorption of manganese complexes occurred. Simultaneous administration of Fe(III), Zn(II), Hg(II), and Cu(II) salts significantly reduced the excreted ^{14}C activity in urine and in exhaled air. It was concluded that formation of stronger and less soluble complexes of the ethylenebis (dithiocarbamate) (EBDC) anion and its degradation products were responsible for this fact and that the presence of certain naturally occurring cations in food might reduce the amount of EBDC residues absorbed. This depression of the absorption rate has to be considered in estimating hazards due to low levels of maneb residues in food. (Author abstract reprinted by permission of the American Chemical Society)

79-1658. Shono, T.; Ohsawa, K.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Metabolism of *trans*- and *cis*-cypermethrin, and decamethrin by microsomal enzymes.** *J. Agric. Food Chem.* 27(3): 316-325; 1979. (21 references)

Microsomal systems are used to compare the metabolism of *trans*- and *cis*-permethrin by mouse liver, rat liver, and housefly and cabbage looper preparations and of *trans*- and *cis*-cypermethrin and decamethrin by mouse liver. Esteratic cleavage is more extensive for trans pyrethroids than for cis pyrethroids, while the relative extent of oxidative metabolism of the two isomers depends on the enzyme source. Species and isomer differences are noted in the preferred sites of permethrin hydroxylation, i.e., trans or cis methyl group and 2′, 4′, or 6 position of the alcohol moiety. With the cyanopyrethroids, mouse microsomes hydroxylate the 5 position in addition to the 4′, trans methyl, and cis methyl sites. Several hydroxymethyl derivatives are further oxidized to the corresponding aldehydes and carboxylic acids. Four isomers of 2-carboxy-3-(2,2-dichlorovinyl) -2- methylcyclopropane carboxylic acid are described. Thirteen to twenty-one metabolites of each pyrethroid are identified in the mouse microsomal systems. (Author abstract reprinted by permission of the American Chemical Society)

79-1659. Schultz, D. P.; Harman, P. D.; Luhning, C. W. (US Dep. Inter., Fish & Wildl. Serv., Southeastern Fish Control Lab., Warm Springs, GA 31830) **Uptake, metabolism, and elimination of the lampricide 3-trifluoromethyl- 4-nitrophenyl by largemouth bass (*Micropterus salmoides*).** *J. Agric. Food Chem.* 27(2): 328-331; 1979. (12 references)

Largemouth bass (*Micropterus salmoides*) exposed to a 1.0-μg/ml solution of the lampricide 3-trifluoromethyl-4-nitro^{14}C-phenol (TFM) for up to 24 hr accumulated radioactive residues in all tissues analyzed at each of five successive sampling periods. Maximum concentrations occurred after 8 hr in brain and muscle and after 12 hr in blood, liver, kidney, and head plus viscera. Concentrations of radioactivity in the bile increased throughout the experiment. In a second group of fish exposed to 1.0 μg/ml of ^{14}C-TFM for 12 hr and then transferred to lampricide-free flowing water, the concentration of radioactive materials in tissues generally decreased with time throughout a 72-hr elimination period. No TFM was detected in muscle tissue 12 hr after the fish were transferred to lampricide-free water. The presence of conjugated TFM in the bile was confirmed. Hexane/ether extracts contained ^{14}C-TFM and other unidentified ^{14}C materials from muscle and head plus viscera, whereas methanol extracts taken after the hexane/ether extraction contained only a negligible amount of ^{14}C-TFM but large quantities of unidentified, polar ^{14}C compounds. (Author abstract reprinted by permission of the American Chemical Society)

79-1660. Miles, J. W.; Mount, D. L.; Staiger, M. A.; Teeters, W. R. (Vector Biol. & Control Div., Bur. Trop. Dis., CDC, US Dep. HEW, Atlanta, GA 30333) ***S*-Methyl isomer content of stored malathion and fenitrothion water-dispersi-**

ble powders and its relationship to toxicity. *J. Agric. Food Chem.* 27(2): 421-425; 1979. (10 references)

A study was undertaken to determine the role of *S*-methyl isomer formation in the toxicity of malathion and fenitrothion water-dispersible powders held in tropical storage. The *S*-methyl isomers of malathion and fenitrothion was synthesized, and high-pressure liquid chromatography and gas-liquid chromatography methods were developed for their determination in powder formulations. Samples of malathion water-dispersible powders returned from storage in tropical countries were found to have *S*-methyl isomer contents as high as 3.3% and rat oral LD50 values of 500 mg/kg compared to fresh powders containing less than 0.3% of the isomer and having rat oral LD50 values of above 2500 mg/kg. Increasing *S*-methyl isomer content and toxicity were also observed in malathin water-dispersible powders held at elevated temperatures in the laboratory. The rate of formation of *S*-methyl isomer of malathion was found to depend upon the type of "inert" ingredients in the formulation. No increase in toxicity was observed in fenitrothion powders stored at elevated temperatures although the *S*-methyl isomer was formed in concentrations up to 1%. (Author abstract reprinted by permission of the American Chemical Society)

79-1661. Hendricks, J. D.; Putnam, T. P.; Sinnhuber, R. O. (Dep. Food Sci. Technol., Oregon State Univ., Corvallis, OR) **Effects of dietary dieldrin on aflatoxin B_1 carcinogenesis in rainbow trout (*Salmo gairdneri*).** *J. Environ. Path. Toxicol.* 2(3): 719-728; 1979. (22 references)

Six-wk-old Shasta strain rainbow trout were fed varying amounts of aflatoxin B_1 (AFB_1) and/or dieldrin in the diet for 12 mo. Fish were sampled at 1, 2, 4, 6, 9, and 12 mo for dieldrin analysis, histopathology, and tumor incidence. Growth rate of fish receiving 5 ppm dieldrin alone, or 6 ppb AFB_1 alone, were significantly depressed ($p < 0.025$ and $p < 0.001$, respectively). In fish receiving both 5 ppm dieldrin and 6 ppb AFB_1 the inhibitory effect of the aflatoxin was reduced by dieldrin, resulting in growth patterns similar to dieldrin alone. Groups of fish on AFB_1 containing diet had significantly lower liver weight/body weight ratios ($p < 0.001$) at 9 and 12 mo than did control or dieldrin-fed fish. Dieldrin accumulation was characterized by a rapid increase in residue levels (0.9 ppm) during the first 2 mo, followed by a period of more gradual increase at 12 mo (1.6 ppm). No tumors appeared in fish fed control or dieldrin containing diets. A slight increase ($p < 0.1$) in incidence of hepatocellular carcinomas and tumor diameters were noted in trout fed AFB_1-dieldrin diets when compared with fish receiving AFB_1 alone.

79-1662. Draughon, F. A.; Ayres, J. C. (Dep. Food Sci., Univ. Georgia, Athens, GA) **Effect of selected pesticides on growth and citrinin production by *Penicillium citrinum*.** *J. Food Sci.* 43(2): 576-578; 1978. (21 references)

The effects of pesticides on the growth of *Penicillium citrinum* and on production of the mycotoxin citrinin were determined. The pesticides studied were naled, dichlorvos, malathion, pyrethrum, methoxychlor, mevinphos, ethion, diethyl toluene, allethrin, diazinon, trithion, guthion, and atrazine. All pesticides inhibited growth and/or citrinin production to some extent. The most effective were dichlorvos, malathion, and naled. The least effective were diethyl toluamide and methoxychlor. No pesticides completely inhibited citrinin production at 100 μg/l. All pesticides, except mevinphos, inhibited citrinin production by at least 25% at the 1 μg/l level.

79-1663. Lovgren, T.; Pettersson, K.; Punnonen, R. (Dep. Biochem. & Pharm., Abo Academy, SF-20500 Abo 50, Finland) **Estrogen receptor forms in human myometrial cytosol.** *J. Steroid Biochem.* 10(2): 155-160; 1979. (14 references)

Myometrial tissues from normal uteri of patients after undergoing hysterectomy were homogenized and exposed to the protease inhibitor diisopropylfluoro phosphate (DFP). Aliquots of cytosol were incubated with various concentrations (0.16-5.0 n*M*) of ^{3}H-estradiol with or without a 100-fold excess of unlabeled estradiol. Supernatants were used for the measurement of radioactivity after a 30 min incubation period, and dissociation constants and binding capacities were calculated. The dissociation constant for the estradiol complex in cytosol with and without DFP was the same order of magnitude (0.066 and 0.059 n*M*, respectively). The sedimentation coefficient of the estogen receptors were 9.0, 5.4, and 4.3 *S*. The amount of the receptor was dependent on the time of DFP addition; 9.0 to 4.3 receptor transformation was catalyzed by the protease in cytosol. The estradiol binding capacity of the receptors without DFP was increased compared to cytosol exposed to DFP.

79-1664. Cardy, R. H.; Renne, R. A.; Warner, J. W.; Cypher, R. L. (Dep. Pathol., Litton Bionetics, Kensington, MD) **Carcinogenesis bioassay of technical-grade piperonyl butoxide in F344 rats.** *J. Natl. Cancer Inst.* 62(3): 569-578; 1979. (16 references)

Groups of 50 barrier-raised male and female inbred F 344 rats were fed 10,000 ppm (high dose) and 5,000 ppm (low dose) α-[2(2-butoxyethoxy) ethoxy]-4,5-methylenedioxy-2 propyltoluene (PB) in the diet for 24 mo. Histopathologic examinations were carried out on all tissues and organs from dead and sacrificed animals. Survival curves illustrated that PB-treated females, but not males, had a significantly shorter life span than controls. A slight dose-related difference in growth rate was observed in both sexes; control males and females weighed 426 and 302 g, respectively, at the end of 99 wk, while average weights of high-dosed males and females were 357 and 231 g, respectively. The total incidence of tumors was high for all groups, and was statistically unrelated to administration of PB. Males had a higher total incidence of tumors, and at earlier times. Malignant lymphomas and leukemias were much more frequent in dosed females (30%) than in their control counterparts (5%), and appeared to be dose-related. The incidence of this class of neoplasm was much higher in control than in treated males. There were no significant differences between control

and treated groups with respect to other types of tumors.

79-1665. Johansson, A.; Camner, P. (Wenner-Gren Inst., Univ. Stockholm, S-11345 Stockholm, Sweden) **Alveolar macrophages from paraquat-exposed rabbits. A study by X-ray microanalysis after oxygen plasma microincineration.** *J. Ultrastruct. Res.* 66(1): 85-86; 1979.

Rabbits were injected ip with paraquat at a dose of 10-20 mg/kg. After a one to three wk period, macrophages demonstrated changes similar to those seen following exposure to nickel dust. Cells contained several big lamellated bodies, and in some cells, these bodies took up almost the entire cytoplasm. Tests using X-ray microanalysis indicated that these bodies contained phosphorus.

79-1666. Yim, G. K. W.; Holsapple, M. P.; Pfister, W. R.; Hollingworth, R. M. (Dep. Pharmacol. & Toxicol., Purdue Univ., W. Lafayette, IN 47907) **Prostaglandin synthesis inhibited by formamidine pesticides.** *Life Sci.* 23(25): 2509-2515; 1978. (31 references)

The similarities of two formamidine pesticides, chlordimeform, and amitraz to aspirin type compounds were investigated in a series of experiments. Male Sprague-Dawley rats were injected sc with a 15% suspension of dried brewer's yeast to induce fever. Chlordimeform and amitraz demonstrated antipyretic and anti-inflammatory activities when administered ip to febrile rats at levels of 5 to 80 mg/kg. The rank of the four test compounds according to their antipyretic activity was indomethacin > chlordimeform > amitraz ≥ aspirin. The similarity of the analgesic action of formamidine pesticides to that of aspirin were believed to be related to their abilities to inhibit prostaglandin synthesis. The ability of these pesticides to inhibit the synthesis of prostaglandin E2 from arachidonic acid by bovine seminal vesicle microsomes was tested *in vitro*. After incubation of the lyphilized microsomes with two concentrations each of chlordimeform, amitraz, indomethacin, or aspirin, PGE_2 synthesis was measured by TLC and scintillation counting techniques. I50 values calculated from % inhibition plots of the prostaglandin were 34 ± 19 for chlordimeform and 880 ± 170 for amitraz at 0.4 μM, and 145 ± 36 for chlordimeform and > 1500 for amitraz at 50 μM. These findings suggest that the mechanism of antipyretic/anti-inflammatory action of the formamidine pesticides is similar to that of the aspirin type compounds on the basis of the inhibition of prostaglandin synthesis.

79-1667. Bell, J. U.; Van Petten, G. R.; Taylor, P. J.; Aiken, M. J. (Div. Pharmacol., Fac. Med., Univ. Calgary, Calgary, Alberta T2N 1N4 Canada) **The inhibition and reactivation of human maternal and fetal plasma cholinesterase following exposure to the organophoshate, dichlorvos.** *Life Sci.* 24(3): 247-254; 1979. (24 references)

Plasma samples were taken from three groups of human subjects: pregnant women betwen 20 and 30 yr of age, non-pregnant of the same age group, and the neonates of the pregnant group immediately following delivery. Plasma cholinesterase activity was measured in each of these three groups. No significant differences were detected in plasma cholinesterase activity between the term fetus and either pregnant or non-pregnant females. Inhibition of plasma cholinesterase was achieved by a 5 min incubation with dichlorvos at an initial concentration of 10 μM. While monitoring the levels for 120 min following exposure, no significant spontaneous reactivation was noted in either the pregnant or fetal groups during the first 30 min following exposure. During the following 90 min, reactivation was significantly greater in the non-pregnant group than for either of the other two groups. Pralidoxime-mediated cholinesterase reactivation in the plasma from non-pregnant women was significantly greater than that noted in the other two groups.

79-1668. Warzok, R.; Schneider, J.; Blaufuss, E. M.; Schwarz, H. (Inst. Allgem. Pathol. & Pathol. Anat. Med. Akad. Erfurt, Erfurt, DDR) **Zum Problem der kanzerogenen Wirkung von Pflanzenschutzmitteln und ihrer Metabolite. [The problem of the carcinogenic effects of herbicides and pesticides and their metabolites.]** *Monatsh. Veterinaermed.* 33(4): 128-130; 1978. (5 references) (German)

The herbicide fenuron, 1-methyl-3-phenylurea (MPU) and its nitrozation product 1-methyl-nitroso-3-phenylurea (MIPU) to which fenuron is almost completely converted in an acid medium were tested on rats for carcinogenicity. MPU and MPU plus $NaNO_2$ were administered via the diet or by ig probe. MPU was found to be non-carcinogenic. Simultaneous feeding of MPU and $NaNO_2$ led to the formation of MIPU in the stomachs of the experimental animals. MIPU was found a strong carcinogen causing the formation of tumors primarily at the site of application. Since $NaNO_2$ is normally contained in human saliva as well as in water the possibility of MIPU formation following oral intake of MPU must be considered.

79-1669. Tscheu-Schlueter, M. (Inst. Wasserwirtschaft, Berlin, DDR) **Zur wassertoxikologischen Einschaetzung ausgewaehlter Gruppen von Pestiziden. [Hydrotoxicological assessment of selected groups of pesticides.]** *Monatsh. Veterinaermed.* 33(4): 132-136; 1978. (German)

Toxicity levels of selected groups of pesticides for certain representative water organisms are given in 5 diagrams designed to serve for the protection of surface waters from contaminants toxic to fish, plankton and algae. The criteria of toxicity used include borderling concentration, threshold concentration, median lethal concentration (LC50) and 90% killing rate or 90% proliferation inhibition in the case of algae. The diagrams indicate LC50 toxicity of a number of synthetic herbicides to *Cyprinus carpio, Poecilia reticulata* and the algae *Ankistrodesmus falcatus*, the toxicity of triazines and urea herbicides to *A. falcatus* and *P. reticulata*, the toxicity of chlorinated hydrocarbons (lindane, DDT, toxaphene) to *Salmo gairdneri, Lepomis macrochirus, Asellus aquaticus, Chironomus plumosus* and *Daphnia magna*, and toxicity of the organophosphorus compounds to *Rutilus rutilus, Perca fluvialis, Phoxinus phoxinus* and *Gammarus lacus-*

tris. A Water Contaminant Catalogue published in 1975 by the Institute of Water Resources Management of the DDR is mentioned.

79-1670. Seiler, J. P. (Swiss Fed. Res. Stn., CH-8820 Waedenswil, Switzerland) **The genetic toxicology of phenoxy acids other than 2,4,5-T.** *Mutat. Res.* 55(3-4): 197-226; 1978. (133 references)

The genetic toxicology of the phenoxy herbicides including such compounds as 2,4-D, MCPA, 2,4-DP, mecoprop, MCPB, and 2,4-DB are reviewed. The structure of the compounds mentioned are discussed in relation to mechanisms of metabolism and degradation. The mammalian toxicity of the phenoxy herbicides has been reported to be low. Other experiments are mentioned that have investigated the toxic action and metabolism of these compounds in microorganisms, plants, and insects. Photochemical degradation pathways for 2,4-D are also given. The genetic action of the phenoxy herbicides are examined in relation to their action on nucleic acids. Other studies review their effects in connection with chromosome aberrations, mutagenic activity to somatic cells, and cytotoxicity in mammalian test systems. The comparison is made between the DNA repair capacities of lesion induced by 2,4-D and the organochlorine compound, dieldrin. Cytogenetic effects of the phenoxy acids in mouse bone-marrow cells have also been investigated. The potential risk of the phenoxy herbicides are discussed in terms of the residues of these compounds permitted on various edible products.

79-1671. NCI, Bethesda, MD 20014 **Bioassay of chlorobenzilate for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 75: 45 pp.; 1978. (17 references)

Osborne-Mendel rats and B6C3F1 mice (50 males and 50 females of each species) were given chlorobenzilate in the diet for 78 wk followed by observation for 12-13 wk in mice tests and 32-33 wk in rat tests. Concentrations of 2995 and 1660 ppm chlorobenzilate were the high and low doses for male rats while 2229 and 1175 ppm were the doses administered to female rats. Male mice were dosed with 7846 and 4231 ppm chlorobenzilate, while female mice received 5908 and 3200 ppm. Hepatocellular carcinomas increased in dosed mice (67% for low dose and 49% for high dose). Cortical adenoma of the adrenal gland occurred in low dose male and high dose female rats. While it was concluded that orally administered chlorobenzilate was carcinogenic in mice, there was insufficient evidence for confirmation of carcinogenicity in rats.

79-1672. NCI, Bethesda, MD 20014 **Bioassay of daminozide for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 83: 114 pp.; 1978. (18 references)

Daminozide (aminozide) was administered in the diet to Fischer 344 rats and B6C F1 mice at dose levels of either 5000 or 10000 ppm for a period of 104 wk. The animals were then observed for one wk after the chemical was no longer administered to them. The female mice receiving the higher dose level were significantly lower in body weights than were the corresponding controls. No other clinical effects caused by the administration of daminozide were noted. While a significantly higher incidence of interstitial-cell tumors of the testis occurred in male rats receiving the chemical than in controls, the association between these tumors and the chemical was deemed doubtful in these experiments. Adenocarcinomas of the endometrium and leiomyosarcomas of the uterus in female rats occurred only in the groups receiving the chemical, however, the incidence was too low to carry any statistical significance. In male mice a dose-related relationship was noted in the incidence of hepatocellular carcinomas, but the evidence was not conclusive that the chemical actually caused the disease.

79-1673. NCI, Bethesda, MD 20014 **Bioassay of dicofol for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 90: 46 pp.; 1978. (26 references)

Osborne-Mendel rats and B6C3F1 mice were used to study the possible carcinogenicity of dicofol when the chemical was administered in their feed at levels of 942 or 471 ppm for male rats, 760 or 380 ppm for female rats, 528 or 264 ppm for male mice, and 243 or 122 ppm for female mice. The chemical was administered for a 78 wk period, followed by a time of observation lasting 34 wk for rats and 14-15 wk for mice. No correlation was noted between dietary concentration of the chemical and mortality in either species. The only neoplasm which occurred at significantly higher levels in treated animals than in untreated animals was hepatocellular carcinomas in male mice. The results of these experiments support the conclusion that dicofol is carcinogenic for male B6C3F1 mice in that it causes hepatocellular carcinomas to develop under conditions similar to those in this study.

79-1674. NCI, Bethesda, MD 20014 **Bioassay of anilazine for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 104: 99 pp.; 1978. (31 references)

Fischer-344 rats and B6C3F1 mice were used to study the possible carcinogenicity of anilazine. The animals were fed either 500 or 1000 ppm of the chemical in their food for 103 wk. An observation period of 1-6 wk followed the treatment period. Body weight was not affected by treatment with anilazine in the rats and in the female mice. However, it was noted that the male mice suffered a decrease in weight gain during the treatment period. There was no increased incidence of tumors of any type in these test animals. It was concluded that there is no evidence at this time for suspecting carcinogenic behavior from anilazine.

79-1675. NCI, Bethesda, MD 20014 **Bioassay of 2,3,5,6-tetrachloro- 4-nitroanisole for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 114: 54 pp.; 1978. (19 references)

Fischer-344 rats and B6C3F1 mice were fed diets containing 0.012 or 0.006% 2,3,5,6- tetrachloro- 4-ni-

troanisole (TCNA) for 104 wk. Observations of rats were continued for 3 wk and of mice for 1 wk after treatment stopped. Necropsy and histopathological examinations of major tissues and organs were performed. There were no significant correlations between concentration of 2,3,5,6- tetrachloro- 4-nitroanisole and mortality in rats or mice of either sex. In rats there were no significant incidences of neoplasms, except for interstitial-cell testicular tumors in males. These tumors were not considered to be associated with the test compound because of their high and variable spontaneous incidence in Fischer-344 rats. Among mice there were no neoplasms of a statistically significant incidence in females. In males the combined incidence of leukemia and malignant lymphoma was statistically significant. But since these lesions occur spontaneously and variably in B6C3F1 mice, they were not considered to be associated with the test compound. The conclusion reached was that dietary administration of 2,3,5,6- tetrachloro- 4-nitroanisole is not carcinogenic in the animals tested.

79-1676. NCI, Bethesda, MD 20014 **Bioassay of dioxathion for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 125: 43 pp.; 1978. (17 references)

Dioxathion was administered in the feed to Osborne-Mendel rats and B6C3F1 mice for a period of 78 wk. Rats were observed for an additional 33 wk and mice for 12-13 wk after treatment was stopped. The time-weighted averages for male rats were 90 and 180 ppm, and for female rats 45 and 90 ppm. The time-weighted concentrations for male mice were 284 and 576 ppm, and for female mice 467 and 935 ppm. Necropsy and histopathological examinations were carried out. Results indicated that in both species, none of the neoplasms observed were histopathologically unusual or statistically significant. It is concluded that dietary administration of dioxathion was not carcinogenic in the animals tested.

79-1677. NCI, Bethesda, MD 20014 **Bioassay of triphenyltin hydroxide for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 139: 41 pp.; 1978. (17 references)

Fischer-344 rats and B6C3F1 mice were fed triphenyltin hydroxide at either 75 or 37.5 ppm concentrations for a 78 wk period. The animals were observed for an additional 26 wk after the administration of the chemical had ceased. In male mice a positive relationship between the dose level and mortality was noted. Late developing tumors were not noted even though enough animals of each species survived long enough for such to have developed. In both male rats and female mice a slight decrease in weight gain was noted. No signs of toxicity were noted among the female rats given the chemical. While under the conditions of the test in this experimentation there was no evidence of the carcinogenicity of triphenyltin hydroxide to these species of animals, this cannot be taken as proof that the chemical is non-carcinogenic under all conditions.

79-1678. NCI, Bethesda, MD 20014 **Bioassay of of mexacarbate for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 147: 49 pp.; 1978. (20 references)

Osborne-Mendel rats and B6C3F1 mice were used to study the carcinogenicity of technical-grade mexacarbate. Animals were fed the compound in their feed at levels of 418 or 209 ppm for male rats, 678 or 339 ppm for female rats, 654 or 327 ppm for male mice and 135 or 68 ppm for female mice. The administration of the chemical continued for a period of 78 wk, followed by a 33 or 34 wk period of observation. For rats fed the mexacarbate-treated feed there was no incidence in tumors when compared with controls. The appearance of hepatocellular carcinomas, subcutaneous fibrosarcomas, and fibromas of the skin in male mice surviving at least 55 wk seemed related to the dose level of mexacarbate consumed. This finding was made through use of the Cochran-Armitage test, but not supported by data from the Fischer extract tests. It was concluded that, on the basis of the tests conducted in these experiments, evidence was not sufficient to support claims of carcinogenicity for mexacarbate for the species tested.

79-1679. Bertram, H. P.; Zenzen, C. (Inst. Pharmacol. & Toxicol., Univ. Muenster, D-4400 Munster, BRD) **Pattern of essential and toxic trace elements and organochlorine pesticides in human tissues.** *Nauyn-Schmiedeberg's Arch. Pharmacol.* 307(Suppl.): R-23; 1978.

In order to get more basic information on the toxicological and environmental risk, the evaluation of the pattern of persistent pollutants in human tissues is necessary. Correlation to anamnestic details lead to valuable results: relation to age showed a distinct increase in body burden of organochlorine pesticides (OCPs) without forming a steady-state. In arteriosclerotic persons the OCP content in tissues was elevated. The commonly used relation of OCP content to extractable lipids should not be the only specification, because it may yield wrong information. In the field of trace elements, tissues like kidneys, liver, brain, spleen and hair were analyzed. Heavy metal content of hair seems to be correlated: specimens with Cd concentrations above mean also show elevated Pb levels. Significant differences regarding sex were found in the Cd content of hair samples: females had a higher mean with extended range that males, possibly caused by use of hair cosmetics. The trace element pattern may be abnormal in a wide variety. (Author abstract by permission, abridged.)

79-1680. Kirsch, D.; Weger, N. (Dep. Toxicol. & Pharmacol., Fed. Armed Forces Med. Coll., D-8000 Munich 40, BRD) **Effects of soman and bispyridinium oximes on the isolated, circumfused cervical ganglion of the rat.** *Nauyn-Schmiedeberg's Arch. Pharmacol.* 307(Suppl.): R-24; 1978. (1 reference)

To elucidate the mechanism of soman poisoning and the protective effect of the bispyridinium compounds HGG 12 and 42, the changes of action potentials (AP) in isolated cervical ganglia of rat were measured. In order to assess the deviation of metabolism from steady state due to excitation, continuous measurement of NADH fluorescence was ap-

plied. In soman poisoning, the action potential decreased in a train of impulses (6 Hz, 30 sec) very rapidly, even though a single AP could be obtained after a period of recovery of 30 min with a concentration up to 1 m*M* indicating paralysis due to depolarization by accumulation of acetylcholine. HGG 42 Cl showed, under normal conditions, an inhibitory effect on N-receptors like hexamethonium whereas HGG 12 showed a higher affinity for M-receptors like atropine, but with the same affinity for N-receptors, decreasing the AP by 50% with 65 μM. In soman poisoning, both compounds delayed the decrease of the AP by a protective effect on the N-receptors. A competition between inhibitors and acetylcholine for the N-receptor is suggested, which would allow synaptic transmission with acetylcholine concentrations which normally depolarize the post-synaptic membrane. (Author abstract by permission, abridged)

79-1681. Schaumburg, H. H.; Spencer, P. S. (Coll. Med., Albert Einstein Coll. Med., Bronx, NY 10466) **Toxic neuropathies.** *Neurology* 29(4): 429-431; 1979. (12 references)

Three types of toxic neuropathies corresponding to the principal component of peripheral nerves are outlined. Toxic distal axonopathy is the most common morphological reaction of the PNS to exogenous toxins. Of gradual onset, this disorder involves axonal degeneration in the central as well as the peripheral nervous system. Among agents that produce human toxic axonal neuropathy are drugs and environmental agents, such as acrylamide monomers, inorganic arsenic, organophosphates (TOCP, leptophos) and PCB's.

79-1682. MacDonald, M. G.; Kaminsky, L. S. (Div. Neonatol., Children's Hosp., Natl. Med. Cent., Washington, DC) **Development of the hepatic monoxygenase system and metabolism of warfarin in the perinatal rat.** *Pediatr. Res.* 13(4, pt. 2): 370; 1979.

Male Sprague Dawley rats and their mothers were measured for components of monooxygenase systems of hepatic microsomes between 17 (6 days prenatal) and 55 days (pubertal) postconception. Metabolites of warfarin entaniomers were quantified by high pressure liquid chromatography. At 21 days, levels of cytochrome P450 and cytochrome *c* reductase increased reaching their maximum at day 27 postconception. A second increase in these compounds occurred at puberty. Cytochome b_5 was also present prenatally and increased with age up to 50 days postconception. No effects were seen on birth, sex, weaning or puberty due to cytochrome b_5. Metabolism of *R*- and *S*-warfarin took place from 19 days postconception and increased wth age. Warfarene, the major metabolite of *R*-warfarin was eluted at 8 min by HPLC. In adult hepatic preparations, the major metabolite, 7/OH warfarin eluted at 13 min. This disparity may be due to developmental changes in the P450 cytochrome. Pregnant and non-pregnant females had similar patterns of warfarin metabolism and P450 levels. The decreased metabolism of warfarin in the pregnant rats suggested the presence of inhibitory factors.

79-1683. Webb, G. D.; Sharp, R. W.; Feldman, J. D. (Dep. Physiol. & Biophys., Coll. Med., Univ. Vermont, Burlington, VT 05401) **Effect of insecticides on the short-circuit current and resistance of isolated frog skin.** *Pestic. Biochem. Physiol.* 10(1): 23-30; 1979. (27 references)

The short-circuit current and resistance of isolated frog skin were studied under the influence of various insecticides including aldrin, carbaryl, α-chlordane, γ-chlordane, DDD (TDE), DDT, dieldrin, endrin, heptachlor, lindane, methoxychlor, and nonachlor. When tested at concentrations of 10 μM no effect on either short-circuit current or potential was observed. For most of the chemicals to have an effect a concentration of 0.2 m*M* was required. At this concentration only carbaryl, DDD, dieldrin, and lindane caused significant changes in the short-circuit current of the skin. The short-circuit current was decreased while the resistance was increased in the case of nonachlor. Increases in short-circuit current with a decrease in resistance were caused by DDD, dieldrin, and carbaryl. Both the short-circuit current and the resistance were increased by lindane. These results suggest that the frog skin prevents insecticides from reaching the site at which active sodium transport occurs.

79-1684. Ahmed, M. M.; Walker, C. H. (Dep. Physiol. & Biochem., Univ., Reading, Reading RG6 2AJ, England) **The metabolism of DDT in vivo by the Japanese Quail (*Coturnix coturnix japonica*).** *Pestic. Biochem. Physiol.* 10(1): 40-48; 1979. (16 references)

Intraperitoneal injections of ^{14}C-labeled DDT were given to both male and female Japanese quail (*Corturnix corturnix japonica*). The chemical was administered in dose levels of 13.4 mg/kg. Recoveries in tissues and excreta added together were, for individual compounds and metabolites, DDT 13.5%, DDD (TDE) 5.1%, DDE 21.5%, DDA 24%, and polar metabolites, which were not identified, 17%. The study indicates that, although apolar compounds such as DDT and DDE were not readily excreted, there was slow removal by excretion. The rate of removal had a similar relationship to tissue concentration for both compounds. It is suggested that the quantities of DDD found in the excreta were products of DDT degradation by microorganisms.

79-1685. Esaac, E. G.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **Roles of flavoproteins in degradation of mexacarbate in rats.** *Pestic. Biochem. Physiol.* 10(1): 67-78; 1979. (14 references)

A 20,000*g* supernatant of rat intestine under anerobic conditions degraded mexacarbate to relatively polar compounds. A significant increase in the water-soluble radioactive products was noted after the addition of FAD. Under various experimental conditions, mexacarbate degradation by the intestinal supernatant was changed. As the pH of the incubation mixture was increased a gradual but consistent increase in water-soluble products was noted both when FAD was and was not present. The rate of mexacarbate degradation was stimulated by an increase in reaction temperature. Similarly, increases in the rate of degradation were noted with

increases in substrate concentration. While the results of this study indicate that the flavoprotein-flavin cofactor system was significant in the effects observed, the role of this system on the detoxification of mexacarbate in vivo is not yet known.

79-1686. Tanaka, K.; Kurihara, N.; Nakajima, M. (Dep. Agric. Chem., Kyoto Univ., Kyoto, Japan) **Oxidative metabolism of tetrachloro cyclohexanes, pentachloro cyclohexanes, and hexachloro cyclohexenes with microsomes from rat liver and house fly abdomen.** *Pestic. Biochem. Physiol.* 10(1): 79-95; 1979. (38 references)

The metabolism of isomers of 3,4,5,6-tetra chlorocyclohexene, 1,3,4,5,6- pentachloro cyclohexene, and 1,2,3,4,5,6-hexachloro cyclohexene was carried out by microsomal mixed-function oxidase systems taken from rat liver and house fly abdomen. These chemicals were metabolized to isomers of tetrachloro cyclohexanol, 2,4,5-trichlorophenol, and 2,3,4,5-tetrachlorophenol, respectively. The studies determined that the metabolic reactions observed proceeded mainly by an ene-like hydroxylation which was accompanied by double bond migration. The fact that carbon monoxide, piperonyl butoxide, and SKF 525-A were able to inhibit the process suggests that the hydroxylating enzyme was cytochrome P450 dependent.

79-1687. Tanaka, K.; Kurihara, N.; Nakajima, M. (Dep. Agric. Chem., Kyoto Univ., Kyoto, Japan) **Oxidative metabolism of lindane and its isomers with microsomes from rat liver and house fly abdomen.** *Pestic. Biochem. Physiol.* 10(1): 96-103; 1979. (22 references)

Lindane and its isomers were metabolized by microsomes from both rat livers and house fly abdomens in the presence of NADPH. When NADPH was not present, the BHC isomers were not metabolized. A major metabolite identified for all five BHC isomers was 2,4,6-trichlorophenol. Also listed as major metabolites were 2,3,4,6-tetra chlorophenol, 2,4,5-trichlorophenol, 2,3,4-trichlorophenol, 2,4,6-trichlorophenol, 2,3,4,5-, and 2,3,5,6-tetrachlorophenol. Under anaerobic conditions with rat liver microsomes lindane produced a *trans*-dechlorination product.

79-1688. Umetsu, N.; Fahmy, M. A. H.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Metabolism of 2,3-dihydro- 2,2-dimethyl- 7-benzofuranyl (di-*n*- butylaminosulfenyl) (methyl)-carbamate and 2,3-dihydro- 2,2-dimethyl- 7-benzofuranyl (morpholinosulfenyl) (methyl)carbamate in cotton and corn plants.** *Pestic. Biochem. Physiol.* 10(1): 104-119; 1978. (14 references)

Stems of cotton and corn plants, and foliage of the same were treated with two selectively toxic derivatives of carbofuran: di-*n*- butylaminosulfenyl (methyl)carbamate and morpholinosulfenyl (methyl)carbamate. Ready translocation of the chemicals occurred following stem injection to all parts of the plants. When the chemicals were applied to the leaves, the translocation was limited to other parts of the leaf. The dibutylaminosulfenyl derivative was hydrolyzed in the cotton plants to form carbofuran which was subsequently oxidized at the 3-position of the ring and the *N*-methyl group. Plant conjugates were then formed from these oxidized metabolites. 3-Hydroxycarbofuran, 3-ketocarbofuran phenol and *N*-hydroxymethyl carbofuran were major metabolites. The overall metabolism was similar for corn plants, but far slower.

79-1689. Kurihara, N.; Tanaka, K.; Nakajima, N. (Radioisot. Res. Cent., Kyoto Univ., Kyoto, Japan) **Mercapturic acid formation from lindane in rats.** *Pestic. Biochem. Physiol.* 10(2): 137-150; 1979. (31 references)

Lindane was administered ip to male Wistar rats. Rat urine was found to contain 4-chloro-, 2,4-dichloro-, 3,4-dichloro-, 2,3,5-trichloro-, and 2,4,5-trichloro phenylmercapturic acids as the major metabolites. The most important intermediate metabolite was (36/45)-hexachlorocyclohexane (HCCHE). The polychloro cyclohexenes formed were directly conjugated with glutathione, rather than their transformation products. While this may be a direct attack of the glutathione on the polychloro cyclohexenes, for the (36/45)-HCCHE some other transformations seem to precede this action. These transformations may be dechlorination or dehydrochlorination. In all cases studied further, dehydrochlorination produced *S*-chlorophenyl glutathiones and then the mercapturic acids.

79-1690. Ghiasuddin, S. M.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **DDT inhibition of Ca-ATPase of the peripheral nerves of the American lobster.** *Pestic. Biochem. Physiol.* 10(2): 151-161; 1979. (34 references)

A Ca-ATPase which is sensitive to DDT has been isolated from the peripheral nerves of the lobster, *Homarus americanus*. The I50 of the enzyme to DDT was found to be on the order of 1 n*M* with a low temperature quotient. Another Ca-ATPase was found in lobster peripheral nerves that was DDT-insensitive. Maximum inhibition of the DDT-sensitive Ca-ATPase occurred in the presence of DDT solutions at pH 7.3. As incubation time was increased, the extent of ATP hydrolysis also increased. The ATPase was found to work over a wide range of ATP concentrations. Sensitivity of the ATPase was found to sodium and potassium ions, and it was stimulated by calcium ions. The confirmation of a Ca-ATPase was achieved by tests with ruthenium red. Mg ions are not needed for the activity of the enzyme suggesting that it is not a Ca-Mg-ATPase. When ATP is present in the lobster axonic membrane, DDT is able to inhibit the process of calcium ion binding. These findings suggest the importance of the role that Ca-ATPase plays in regulating the level of calcium ion in the membrane.

79-1691. Bentley, J. P.; Weber, G. H.; Gould, D. (Dep. Biochem., Health Sci. Cent., Univ. Oregon, Portland, OR) **The effect of diflubenzuron feeding on glycosaminoglycan**

and sulfhemoglobin biosynthesis in mice. *Pestic. Biochem. Physiol.* 10(2): 162-167; 1979. (17 references)

Adult Swiss female mice were given diflubenzuron in the diet at various concentrations, 50, 200, 400, 1000, or 2000 ppm. No major differences were noted between animals receiving the chemical and controls. Cyanosis was noted among animals receiving the higher two doses after a period of 3 wk. When the study was concluded a period of about 3 wk was required for all evidence of cyanosis to pass. No significant decreases were noted in the specific activity of chondroitin sulfate or hyaluronic acid isolated from the skin of treated animals, indicating that the inhibition of biosynthesis did not occur and that diflubenzuron does not inhibit the hexosamine transferases which are responsible for the biosynthesis of the mucopolysaccharides. The study shows clearly that diflubenzuron does not inhibit the biosynthesis of hexosamine-containing compounds, such as hyaluronic acid, in a manner similar to the inhibition of chitin biosynthesis in insects.

79-1692. Mehrle, P. M.; Finley, M. T.; Ludke, J. L.; Mayer, F. L.; Kaiser, T. E. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Bone development in black ducks as affected by dietary toxaphene.** *Pestic. Biochem. Physiol.* 10(2): 168-173; 1979. (31 references)

Black ducks, 1-yr-old, were fed with commercial duck breeder mash coated with 0, 10, or 50 μg/g toxaphene. Breeders fed 10 or 50 μg/g toxaphene for 90 days suffered no mortality. Body weights were not significantly different in females from female controls. However, males suffered lower body weights at the dose of 50 μg/g. Reproduction was not affected, either from egg production or from hatachability standpoints. A significant decrease was noted in growth of ducklings at the early stages of life. However, by 42 days after birth this was no longer significant. Within 14 days from hatching, backbone development was impaired. Collagen was significantly decreased in cervical vertebrae of ducklings fed on the 50 μg/g diet. Calcium concentrations were significantly increased in vertebrae of ducklings fed either dose. Tibia development was not impaired. Residues of toxaphene in ducklings increased with increasing dose levels.

79-1693. Seuferer, S. L.; Braymer, H. D.; Dunn, J. J. (Dep. Microbiol., Louisiana State Univ., Baton Rouge, LA) **Metabolism of diflubenzuron by soil microorganisms and mutagenicity of the metabolites.** *Pestic. Biochem. Physiol.* 10(2): 174-180; 1979. (20 references)

Four fungal isolates were exposed to diflubenzuron. These isolates were *Fusarium* sp., *Cephalosporium* sp., *Penicillium* sp., and *Rhodotorula* sp. In each case the microorganisms rapidly degraded the insecticide. Products achieved by cleavage of the urea bridge of the chemical included 2,6-difluorobenzoic acid, 4-chlorophenylurea, 4-chloroaniline, 4-chloroacetanilide, acetanilide, and 4-chlorophenol. Borderline mutagenesis was noted in the case of 4-chloroaniline, 4-chlorophenol, and 4-chlorophenylurea.

79-1694. Nomeir, A. A.; Dauterman, W. C. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) ***In vitro* metabolism of EPN and EPNO by mouse liver** *Pestic. Biochem. Physiol.* 10(2): 190-196; 1979. (18 references)

Enzyme preparations from mouse liver were used to study the metabolism of EPN and EPNO (*O*-ethyl *O*-*p*-nitrophenyl phenylphosphonate). A faster metabolism was noted in the case of EPNO with the highest metabolic activity being observed in the presence of NADPH and glutathione together. EPN was metabolized to its oxygen analog, EPNO and *p*-nitrophenol by the liver microsomes in the presence of NADPH. In the presence of GSH only a slight metabolism of EPN was noted using a 100,000 *g* supernatant. The addition of NADPH caused an increase in the metabolism of EPNO by liver microsomes. Oxidative dearyltion of EPNO by liver microsomes either did not occur at all, or only to a very slight degree. Active degradation of EPNO occurred with the 100,000 *g* supernatant. The formation of *p*-nitrophenol occurred at a higher initial rate with EPN than EPNO as a result of incubation of these chemicals with the liver microsomes.

79-1695. Ioannou, Y. M.; Dauterman, W. C. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) ***In vitro* metabolism of diazinon and etrimfos by corn plant preparations.** *Pestic. Biochem. Physiol.* 10(2): 212-218; 1979. (16 references)

Diazinon was readily degraded by homogenates of excised roots or stems and leaves of corn seedlings. Up to 72% of the chemical was degraded to 6-methyl- 2-(1-methylethyl)- 4-hydroxypyrimidine and an unidentified metabolite. The highest degradative activity was found in corn seedling homogenates which were 6 days old. Optimum pH was 6.0 and the activity resided in the cytosol. Degradation by corn plant homogenates did not occur in the case of etrimfos.

79-1696. Andujar, M. M.; Varela, G.; Navarro, M. P. (Inst. Nutr. Consefo Super. Invest. Ceint., Fac. Farm., Madrid, Spain) **Dieldrin, Ca and P balance, and characteristics of the egg in the quail (*Coturnix coturnix japonica*).** *Poult. Sci.* 57(3): 596-602; 1978. (27 references)

A study was made of the Ca and P balance, Ca and P content in the femur, physical characteristics of the egg, mineral structure of the shell, and the number of eggs of quails treated with dieldrin (20 mg/kg of diet) for 48 days. The diet contained 3.24% Ca and 0.72% P. The Ca and P balance, the bone contents of Ca and P and the calcemia in the males were not changed by the pesticide. In the females, the pesticide decreased the amount of excreted Ca and Ca in the egg, for which reason the coefficient of nutritive utilization (CNU), the coefficient of corporal retention (CCR), and the Ca level in the femur were greater in treated laying quails. The calcemia remained stable, and the balance of P was not significantly modified by the dieldrin. The study of weight, size, and strength of the egg did not reveal any infleunce of the dieldrin, and egg production fluctuated throughout the

test period. (Author abstract by permission)

79-1697. Bretag, A. H.; Caputo, C. (Author address not given) **The nature of the antimyotonic action of 2,4-D on the soleus muscle of the rat.** *Proc. Aust. Physiol. Pharmacol. Soc.* 9(2): 150P; 1978. (5 references)

The antimyotonic action of 2,4-D was investigated in isolated soleus muscles of female Lister rats. After the isolated muscle was dissected to the dorsal surface, a middle of the fiber, 3 electrode voltage-clamp apparatus was attached. Tetrodotoxin was used to block sodium conductance and at other times tetraethyl ammonium chloride was used to block potassium conductance. Experiments were run in the presence and absence of anthracene 9-carboxylic acid (A-9-C) with 2,4-D to study the inhibition of A-9-C in the presence of this herbicide. Results showed that membrane resistance was significantly increased by either or both A-9-C or 2,4-D. Although the results show that 2,4-D does not act on sodium or potassium currents, it was suggested that the lack of reliable measurements of these currents with the 3 electrode voltage-clamp might still leave room for this pathway to be the most likely explanation for the antimyotonic action of 2,4-D on the rat soleus muscle.

79-1698. Ahamad, I. K.; Begum, M. R.; Sivaiah, S.; Rao, K. V. R. (Dep. Zool., SV Univ., Tirupati 517 502, India) **Effect of malathion on free amino acid, total proteins, glycogen and some enzymes of pelecypod *Lamellidens marginalis* (Lamarck).** *Proc. Indian Acad. Sci. B.* 87(12): 377-380; 1978. (17 references)

Studies were performed in which specimens of the fresh water mussel *Lamellidens marginalis* were exposed to 5 ppm malathion for 48 hr. After they were sacrificed, foot, mantle and hepatopancreas tissues were isolated and analyzed for glycogen, total proteins, total free amino acids, succinate dehydrogenase, aspartate, and alanine aminotransferase. The activities of aspartate and alanine aminotransferase were enhanced, while all other constituents were reduced as compared to the controls. Metabolic compensation and cooperation among enzymes as a reaction of toxic stress seem to be the cause of the observed changes.

79-1699. Kumari, S. D. R.; Nair, N. B. (Biol. & Fish., Univ. Kerala, Trivandum 695007, India) **Toxicity of some insecticides to *Lepidocephalus thermalis* (Cuv. & Val.).** *Proc. Indian Natl. Sci. Acad. Part B* 44(3): 122-132; 1978. (31 references)

The toxicity of five pesticides commonly used in rice paddies, Dimecron (phosphamidon), malathion, Metacid (methyl parathion), parathion, and endrin, was tested in the small fish *Lepidocephalus thermalis*. Fish were exposed to the pesticides in laboratory holding tanks kept at 27 ± 3°C for 48 hr. Another test designed to see if fish age had any effect on susceptibility to pesticide intoxication was conducted on fish of 50 mm and 30 mm in length using the compounds malathion, methyl parathion, and parathion. The 24 hr and 48 hr LC50 values respectively for *L. thermalis* were determined as follows: Dimecron, 53.63 and 44.25; malathion, 22.69 and 20.61; Metacid, 5.98 and 5.75; parathion, 1.858 and 1.269; and endrin, 0.003754 and 0.003329. The organochlorine pesticides proved much more toxic to the fish than the organophosphorus compounds. Physical reaction of the fish to the pesticides included excitation, muscular spasms, jerky movements, attempts to leap out of the water and finally turning on their sides followed by death. The 24 and 48 hr LC50 values of the young and adult fish showed that the older fish were more resistant to the effects of pesticides than the younger members of the species, a factor that should be considered when conducting bioassay studies.

79-1700. Nishimura, M.; Aoki, M.; Endo, R. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan) **[Effects of an organophosphorus pesticide on rat's muscles of mastication.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 20: 548-549; 1978. (Japanese)

To develop more sensitive methods for detecting symptoms of organophosphorus pesticide poisoning other than the reduction of cholinesterase activity, a method to monitor the function of rat mastication muscles was devised. A rat was fixed on its back and the motion of its lower jaw was recorded by means of a kymograph. A fenitrothion emulsion was administered to the rat at levels of 0.5, 1, 5 and 10 mg/kg orally and the maximum amplitide of motion of the lower jaw was determined at every load (from 200 to 500 g downward on the rat's incisor) for 2-3 hr after each dose. A change in the amplitude of movement after administration of fenitrothion at 10 and 5 mg/kg was noted, with the reduction in the amount of opening and closing of the jaw paralleling the decreased acetylcholinesterase activity observed in the blood. This reduction in amplitude was more sensitive than the reduction of cholinesterase activity at 0.5 mg/kg, (13% reduction in jaw movement amplitude as compared to 0% in the reduction of cholinesterase activity).

79-1701. Agarwal, H. P. (Zool. Surv. India, Jabalpur, M.P., India) **Some observations on the toxic effects of endrin on certain fresh-water gastropods.** *Sci. Cult.* 44(8): 375-377; 1978. (8 references)

The effects of the insecticide endrin on the freshwater gastropods, *Lymnaea acuminata, L. luteola, Indoplanorbis exustus,* and *Viviparus bengalensis* were studied in relation to the difference in size of the gastropods. All specimens were kept in a 300 mm trough containing 3 l of tap water over which endrin was sprayed by syringe. Lethal effects were observed immediately following exposure of the tanks to endrin, with smaller gastropods responding more quickly than larger ones. *I. exustus* was affected first, and all snails except *V. bengalensis* secreted a slimy substance after retracting their visceral organs and falling from the sides of the tank. *V. bengalensis* specimens took the longest to die and were observed floating with their expanded organs long after spraying with endrin. Increasing the amount of water in the tank after endrin spraying prolonged the time for complete mortality of each species. These studies show the high toxicity of endrin

to all four species of gastropods, and the differential toxicity of the insecticide to the four species of freshwater gastropods according to size.

79-1702. Rossouw, D. J.; Engelbrecht, F. M. (Lung Metab. Res. Group, Dep. Physiol. & Biochem., Univ. Stellenbosch, Parowvallei, Cape Province, South Africa) **The effect of oxygen and paraquat on the ^{14}C-glucose oxidation of rabbit alveolar macrophages and lung slices.** *S. Afr. Med. J.* 55(14): 558-560; 1979. (17 references)

The effects of oxygen level and paraquat on the oxidation of ^{14}C-glucose was studied using lung slices and alveolar macrophages isolated from New Zealand white rabbits. The incubation was carried out in 20% and 95% oxygen, with the addition of 0, 0.01, or 1.0 m*M* paraquat. After 1, 2, or 3 hr, radioactivity was measured using a liquid scintillation counter. In 95% oxygen, glycolysis in lung slices progressively increased over the 3 hr, while the pentose pathway increased for only 2 hr, then declined. Paraquat (1.0 m*M*) caused increased 6-$^{14}CO_2$ production in 20% oxygen, but gradually inhibited 6-^{14}C-glucose oxidation in 95% oxygen. The same amount of paraquat stimulated the pentose phosphate pathway in 20% and 95% oxygen. Alveolar macrophages were more sensitive to paraquat exposure than cells from lung slices. With the macrophage culture, in both 20% and 95% oxygen, 1.0 m*M* paraquat inhibited both 6-^{14}C-glucose and 1-^{14}C-glucose oxidation after one hr.

79-1703. Scott, B. R.; Sparrow, A. H.; Schwemmer, S. S.; Schairer, L. A. (Univ. Texas System Cancer Cent., Smithville, TX 78957) **Plant mediated activation of mutagens.** *Tex. J. Sci.* 30(5): 107-115; 1978. (21 references)

The mutagenicity of 1,2-dibromoethane (ethylenedibromide; EDB) was confirmed with liquid bacterial tests, and by addition of plant mixtures to microbial cultures. Various combinations of EDB, plant extracts, and the appropriate microorganisms were placed in an environmental chamber at 37°C and agitated for 30 min or 3 hr, for the *E. coli* or *Aspergillus nidulans* additions, respectively. EDB is capable of being converted to a mutagen by two reaction pathways, one involving a breakdown product *in vitro*, the other being metabolic activation by plants.

79-1704. Seifert, J.; Buchar, E. (Inst. Pharmacol., Czechoslovakian Acad. Sci., CS-12800 Prague 2, Czechoslovakia) **The biosynthesis of pyrimidine nucleotides and cytochrome P-450 content in rat liver microsomes after the administration of α-hexachlorocyclohexane (in vivo study).** *Toxicology* 11(1): 37-44; 1978. (27 references)

Male Wistar rats were given α-HCH (α-BHC) in olive oil at dose levels of 25, 50, 100, 200, or 400 mg/kg. The incorporation of orotic acid into uridine nucleotides of the acid-soluble extracts of the liver was seen to increase as the dose level of α-HCH was increased to 200 mg and at subsequent doses, the incorporation decreased. The utilization of orotic acid for cytidine component synthesis of the pool was markedly decreased even at the lowest level of administration of the chemical. The utilization of palmitic acid for synthesis of microsomal phospholipids increased 75 min after the chemical was administered and remained increased during other intervals after drug application. A decrease was noted in the incorporation of palmitic acid into neutral lipids.

79-1705. N'Diaye, F.; Susbielle, H.; Potier de Courcy, G.; Champigny, O. (Cent. Rech. Nutr., CNRS, F-92190 Meudon-Bellevue, France) **Effets de l'association d'un pesticide, le lindane, a un regime pauvre en soufre sur le deroulement de la gestation chez la ratte. [Effects of the association of the pesticide (lindane) and a sulfur-poor diet on pregnancy in the rat.]** *Toxicology* 11(3): 277-287; 1978. (25 references) (French)

The effects upon gestation and fetal growth, due to the addition of lindane to a diet deficient in sulfur amino acids, were studied in 84 Sprague-Dawley rats. A casein-based (6 or 16%) diet containing lindane at 10 or 100 ppm was fed to the rats. The 100 ppm lindane addition resulted in decreased food ingestion and a delay in weight gain, but fetal weight at 20 days remained unaffected. The introduction of lindane into the 6% casein diet, at either dose, doubled the amount of sulfoconjugates in the urine throughout the pregnancy. With the casein-rich diet, the increase in sulfoconjugates took place only during the second half of gestation. The lower dose of lindane caused a threefold increase in the level of ascorbic acid excretion, but the activities of microsomal enzymes were not modified. At the higher dose, the response of ascorbic acid was very strong, even more so with the 16% casein diet (twelvefold) than with the 6% ration (ninefold). The presence of 10 ppm lindane, regardless of the casein content of the diet, brought no changes in the activity of aminopyrine-*N*-demethylase. It was concluded that the introduction of a high dose of lindane in the food did not perturb the gestation or curtail fetal growth. With 6% casein, the sulfur deficiency was compensated by a stimulation of glucuroconjugation. With 16% casein, in late pregnancy, when the use of glucose for fetal needs may restrict glucuroconjugation, sulfoconjugation was stimulated.

79-1706. Riviere, J. L.; De Lavaur, E.; Grolleau, G. (Inst. Natl. Rech. Agron., Lab. Phytopharm., CNRA, F-78000 Versailles, France) **Effect of polychlorinated biphenyls on drug metabolism in Japanese quail and its progeny.** *Toxicology* 11(4): 329-334; 1978. (29 references)

Female Japanese quail received PCB daily at dose levels of 1 or 5 mg/female. After periods of intoxication lasting 40 days, eggs were collected and the progeny observed until the age of 1 mo. A dose-dependent increase in cytochrome P450 was noted in the adult females receiving the chemical. At hatching, the aniline hydroxylase and aldrin epoxidase activities were higher in treated animals and the effect was dose-dependent. After a 2 wk period the activity of aldrin epoxidase along with cytochrome P450 and microsomal proteins was similar to controls, in those birds re-

ceiving the lower dose of PCB. However, in birds receiving the higher dose, these parameters demonstrated a significant increase. After a 1 mo period, all measured enzyme levels were similar to control levels. The toxicity response to dinitro-*o*-cresol (DNOC) was reduced in treated animals.

79-1707. Giri, S. N.; Krishna, G. (Dep. Physiol. Sci., Sch. Vet. Med., Univ. California, Davis, CA 95616) **The effects of paraquat on prostaglandin synthesis of guinea pig lungs.** *Toxicology* 11(4): 345-351; 1978. (15 references)

Male Hartley guinea pigs were given paraquat ip at 10 mg/kg dose levels. Paraquat did not significantly change prostaglandin synthesis at 12 hr after administration. However, at 24 and 48 hr after administration, prostaglandin synthesis had been significantly reduced. *In vitro* studies were then made of the effects of paraquat on prostaglandin synthesis using a 600 *g* supernatant of guinea pig lung. Paraquat did not inhibit prostaglandin synthesis *in vitro* even at the highest concentration tested, 10 m*M*. Animals treated with paraquat had a significantly reduced amount of lung microsomal protein when measured at 12 and at 24 hr after paraquat exposure. Histopathological studies showed that the treated guinea pigs manifested various degrees of progressively advancing histopathological changes in their lungs. Special notice was taken of congestion, damage to the alveolar epithelium, and perivascular edema at 12 hr after dosing, and a widespread interstitial and alveolar edema, leukocyte infiltration and perivascular clot with cells and fluid in lungs at 24 hr after dosing.

79-1708. Dalela, R. C.; Bhatnagar, M. C.; Tyagi, A. K.; Verma, S. R. (Pollut. Relevant Res. Lab., D.A.V. Coll., Muzaffarnagar 251001, India) **Adenosine triphosphatase activity in few tissues of a fresh water teleost, *Channa gachua* following in vivo exposure to endosulfan.** *Toxicology* 11(4): 361-368; 1978. (20 references)

Channa gachua were continuously exposed for 30 and 60 day periods to 0.5, 0.33, 0.2 and 0.16 of the median lethal concentrations of endosulfan. Oligomycin-insensitive Mg^{2+} ATPase in the brain demonstrated a higher degree of sensitivity to endosulfan as compared to oligomycin-sensitive Mg^{2+} ATPase in the mitochondria. Inhibition of ATPases was higher in the gill as compared to brain tissue. In the kidney the highest inhibition was noted in oligomycin-sensitive mitochondrial Mg^{2+} ATPase. It is noted from these results that endosulfan acts on the energy metabolism *in vivo*, and may interfere with various processes in the body of the fish which require energy for completion.

79-1709. Agrawal, N. K.; Juneja, C. J.; Mahajan, C. L. (Dep. Zool., Univ. Rajasthan, Jaipur 302004, India) **Protective role of ascrobic acid in fishes exposed to organochlorine pollution.** *Toxicology* 11(4): 369-375; 1978. (10 references)

Channa punctatus were fed a pelleted diet containing prawn and fish powder and minced liver which makes for about 125 mg/100 g vitamin C, a level which more than meets the optimum requirements of this fish. The fish were then fed either a normal diet plus 0.25% aldrin or a normal diet plus 0.5% ascorbic acid. Previously conditioned fishes which received aldrin in their diets demonstrated a 25% mortality in 30 days. Polycythemia was noted by a highly significant rise in erythrocyte number, hemoglobin, and hematocrit values. A massive dose of ascorbic acid (500 g/100 g aldrin mixed diet) caused a marked reduction in the mortality of 22.5%, bringing the observed mortality rate down to 2.5%. A significant lowering of the hematological response to aldrin pollution was also noted after the administration of the massive ascorbic acid dose.

79-1710. Nath, G.; Datta, K. K.; Dikshith, T. S. S.; Tandon, S. K.; Pandya, K. P. (Ind. Toxicol. Res. Cent., Mahatma Gandi Marg, Lucknow 226001, India) **Interaction of endosulfan and metepa in rats.** *Toxicology* 11(4): 385-393; 1978. (19 references)

Adult male albino rats were given endosulfan at 11.0 mg/kg/day or metepa at 13.60 mg/kg/day, or both compounds, given one after the other, for a period of 30 days. Mortality rates during the study were irregular. No significant pathologic changes were noted in rats treated with endosulfan, metepa, or their combination when examination was confined to the liver, kidney and epididymis. Metepa did produce severe testicular changes. Animals treated with both chemicals also demonstrated testicular damage, but the changes were less severe than in those animals receiving only metepa treatment. A slight increase was noted in the activity of DNAse after metepa and combination treatments in the testis only. SDH activity was greatly increased in the liver, kidney and testes of metepa-exposed animals. Endosulfan caused a slight decrease in the activity of SDH of liver, ATPase of kidney and alkaline phosphatase of the testes. The highest levels of endosulfan were found in the kidney, the lowest in the blood serum. No evidence of antagonistic effects or potentiation was noted in this study.

79-1711. Triebwasser, K. C.; Story, D. L.; Freedland, R. A. (Dep. Physiol. Sci., Sch. Vet. Med., Univ. California, Davis, CA 95616) **The effect of dietary *o,p'*-DDT on ureagenesis from ammonia by isolated rat hepatocytes.** *Toxicol. Appl. Pharmacol.* 47(2): 237-244; 1979. (32 references)

Hepatocytes isolated from rats which had been fed 1000 ppm *o,p'*-DDT for 2 wk and starved for 48 hr exhibited markedly reduced rates of urea synthesis and citrulline accumulation when incubated with 10 m*M* NH_4Cl and 10 m*M* ornithine. The addition of 10 m*M* lactate to such incubations stimulated the rate of ureagenesis by both control and DDT-treated cells to nearly the same degree but did not eliminate the difference in rates of urea synthesis between control and DDT-treated cells. The activities of carbamoyl phosphate synthetase, ornithine carbamoyl transferase, arginine synthetase, and arginase were similar in livers from control and DDT-treated rats. The kinetics of the simulation of urea synthesis by exogenous ornithine were similar with

hepatocytes from both control and DDT-treated rats. Mitochondria isolated from the livers of control and DDT-treated rats exhibited similar rates of citrulline synthesis from ammonia and ornithine as well as similar responses to *N*-acetyl glutamate and 2,4-dinitrophenol. These results suggest that DDT treatment may produce alterations in the kinetic behavior of urea cycle enzymes which are not detected in the standard assays of these enzymes or DDT treatment may interfere with the intermitochondrial transport processes required during ureagenesis from ammonia. (Author abstract by permission)

79-1712. Curtis, L. R.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **The effects of Kepone treatment on biliary excretion of xenobiotics in the male rat.** *Toxicol. Appl. Pharmacol.* 47(2): 295-303; 1979. (21 references)

Hepatic excretory functions of Kepone (chlordecone) preexposed (10, 50, 150 ppm in daily ration for 15 days) male rats were examined in conjunction with hepatic mitochondrial $Mg2^+$ ATPase (MATPase) activity. Biliary excretion of intravenously administered polar metabolites of imipramine (PMIMP) and phenolphthalein glucuronide (PG) was studied in bile duct-cannulated intact animal preparations, and MATPase was assayed via the continuous method using isolated mitochondria. Biliary excretion of PG and PMIMP was suppressed (73 and 69%, respectively) at 150 ppm, and that of PG and 10 ppm (23%). No significant effect on biliary excretion of these chemicals was evident in the other groups. Volume of bile flow was increased at the highest dose of Kepone exposure while the excretory function was compromised. Inhibition of MATPase was 34% at 50 ppm and 40% at 150 ppm, while 10 ppm Kepone-pretreated animals showed no significant inhibition of this enzyme system. These data suggest that although observed inhibition of hepatobiliary function resulting from Kepone pretreatment can be linked to the inhibition of the MATPase system, a direct correlation may not exist. (Author abstract by permission)

79-1713. Teichert-Kuliszewska, K.; Szymczyk, T. (Dep. Biochem., Med. Sch., P-02097 Warsaw, Poland) **Changes in rat carbohydrate metabolism after acute and chronic treatment with dichlorvos.** *Toxicol. Appl. Pharmacol.* 47(2): 323-330; 1979. (19 references)

Administration to rats of a single dose of dichlorvos (DDVP) equal to 50% of the LD50 caused hyperglycemia which could be prevented, and the effect of the pesticide completely abolished, by administration of increasing doses of insulin. The glucose tolerance curves after po administration of glucose showed impaired regulation of carbohydrate metabolism and changes of the diabetic type. A statistically significant increase in glycogen phosphorylase activity was observed after administration of a single dose (50% LD50) of DDVP. UDPglucose pyrophosphorylase activity was decreased both after acute treatment and after administration of DDVP (5% LD50 daily) for 3 or 7 days, but the enzyme activity became adapted to the pesticide after 14 days of treatment with low doses of DDVP. In experiments *in vitro*, dichlorvos (at concentrations of 0.1, 1.0, and 10 m*M*) stimulated the glycogen phosphorylase activity in liver extract only after 30 min preincubation. Dichlorvos inhibited synthesis of UDPglucose from UTP and G-1-P but only at concentrations as high as 1.0 and 10 m*M*. Changes in glycogen synthetase activity were observed only at a very high dichlorvos concentration (10 *m*M). (Author abstract by permission)

79-1714. Khera, K. S.; Whalen, C.; Angers, G.; Trivett, G. (Bur. Chem. Saf., Health & Welfare Canada, Ottawa, Ontario K1A 0L2, Canada) **Assessment of the teratogenic potential of piperonyl butoxide, biphenyl, and phosalone in the rat.** *Toxicol. Appl. Pharmacol.* 47(2): 353-358; 1979. (17 references)

Technical grades of piperonyl butoxide and biphenyl, and a formulation of phosalone containing 30% (w/w) phosalone, were administered by esophageal intubation to rats on days 6-15 of gestation. Dams were killed on day 22 of gestation and fetuses were evaluated by routine teratologic methods. Test doses ranging from 62.5 to 500 mg/kg for piperonyl butoxide, 12.5 to 50 mg/kg for the phosalone formation, and 125 to 50 mg/kg for biphenyl, elicited neither teratogenicity nor any adverse maternal effects. Biphenyl, at a dose level of 1000 mg/kg, elicited fetal and maternal toxicity. (Author abstract by permission)

79-1715. Ramsey, J. C.; Park, C. N.; Ott, M. G.; Gehring, P. J. (Toxicol. Res. Lab., Health & Environ. Res. Dow Chem. Co., Midland, MI 48640) **Carcinogenic risk assessment: ethylene dibromide.** *Toxicol. Appl. Pharmacol.* 47(2): 411-414; 1979. (8 references)

Ethylene dibromide has been shown to result in an increased incidence of gastric tumors in rats following intubation at 40 mg/kg/day. The US EPA has used a one-hit carcinogenic model with parameters derived from this bioassay in rats to estimate the risk of cancer in humans arising from inhalation exposure to ethylene dibromide. The EPA estimated an almost 100% lifetime incidence of cancer to be expected in workers exposed to 0.4 ppm of ethylene dibromide at citrus fumigation centers. This communication reports a test of the validity of that prediction based on a comparison of the incidence of cancer predicted by the method used by the EPA with that observed in a group of 156 workers employed in the production of ethylene dibromide. The one-hit model, as used by the EPA, predicted a total of 85 tumors above the normal background incidence in this group of employees. A total of eight tumors has been observed. Therefore, use of this model to predict carcinogenic response in humans appears to result in highly exaggerated risk estmimates. (Author abstract by permission)

79-1716. Simon, G. S.; Tardiff, R. G.; Borzelleca, J. F. (Div. Toxicol., Dep. Pharmacol., Med. Coll. Virginia, Richmond, Va 23298) **Failure of hexachlorobenzene to induce dominant lethal mutations in the rat.** *Toxicol. Appl. Phar-*

macol. 47(2): 415-519; 1979. (20 references)

Three groups of 10 male rats each were gavaged with 0, 70, or 221 mg hexachlorobenzene (HCB)/kg/day for 5 consecutive days. Ten other male rats received a single oral dose of 0.5 mg triethylene melamine (TEM)/kg. Both compounds were dissolved in corn oil. Following the last administration, each male rat was allowed to mate with two naive, nulliparous females per wk for 14 consecutive wk. Females were sacrificed on day 14 of gestation. Their ovaries and uteri were exposed and examined for numbers of corpora lutea and total, living and dead implantations. Mating and fertility frequencies were calculated. TEM elicited typical dominant lethal events. HCB did not. Dose-dependent decreases in the numbers of females inseminated and impregnated were observed. (Author abstract by permission)

79-1717. Robinson, C. P.; Beiergrohslein, D.; Smith, P. W.; Crane, C. R. (Coll. Pharm., Oklahoma Univ., Oklahoma City, OK 73190) **Reaction of metamidophos with mammalian cholinesterases.** *US NTIS AD Rep.* AD-058,683: 7pp.; 1978. (12 references)

The lethality of methamidophos, a phosphoramido thioate, to rats (ip, LD50, 15 mg/kg), is similar to that of such potent organophosphate compounds as parathion and paraoxon. Certain distinctive features of its chemical structure and reported failure of cholinesterase inhibited with metamidophos to reactivate spontaneously in insects, prompted this study of its reactions with mammalian cholinesterase to determine if the treatment of poisoning requires modification. Atropine (10 mg/kg) or pralidoxime (60 mg/kg) afforded significant protection against lethality from methamidophos (LD50's 60 ± 0.4 and 52 ± 4.9 mg/kg, respectively). Partial spontaneous recovery of inhibited cholinesterase activity was observed. However, a single dose of pralidoxime, given essentially simultaneously with metamidophos, did not hasten the recovery of cholinesterase activity. (Author abstract by permission)

79-1718. Kazanovskii, E. S. (Izhmo-Pechorsk Vet. Hyg. Res. Inst., Izhmo-Pechorsk, USSR) **Toksichnost' insektitsidov dlya severnykh olenei. [Toxicity of insecticides to reindeer.]** *Veterinariya (Moscow)* (12): 94-95; 1978. (Russian)

The general toxic and acetylcholinesterase-inhibiting effects of organophosphorus insecticides were studied in reindeer. The doses causing 50% inhibition of the acetylcholinesterase activity in the blood (ID50) and the LD50 values were determined from the observation data. The ID50 values are 46.6 mg/kg for ruelen (crufomate) (25%, po), 216.5 mg/kg for ruelen (50%, pour-on method), 26.9 mg/kg for baytex (fenthion) (46%, po) 78.4 mg/kg for tiguvon (fenthion 2%, pour-on method), 87.6 mg/kg for tiguvon (20%, pour-on method), 13.18 mg/kg for phenithion (fenthion) (70%, im), 40.5 mg/kg for trichlorfon (10%, po), 252 mg/kg for trichlorfon (6%, pour-on method), and 15.4 mg/kg for famophos (famphur) (35%, im). The LD50 values were 251.2 mg/kg for ruelen (25%, po), 105 mg/kg for baytex (46% po), 46.2 mg/kg for phenithion (70%, im), 157 mg/kg for trichlorfon (10%, po), and 63.75 mg/kg for famophos (35% im). No residues were detected by chromatographic or enzymatic methods in the meat of animals 30-40 days post-treatment.

79-1719. Erickson, S. J.; Freeman, A. E. (Gulf Breeze Environ. Res. Lab., US EPA, Johns Island, SC 29455) **Toxicity screening of fifteen chlorinated and brominated compounds using four species of marine phytoplankton.** In: *Water Chlorination: Environmental Impact and Health Effects.* R. L. Jolley, ed. (Ann Arbor: Ann Arbor Science) 2: 307-310; 1977. (3 references)

Skeletonema costatum, Thalassiosira pseudonana, Glenodinium halli, and *Isochrysis galbana* were used to study the effects of chlorinated and brominated compounds on cell division. In each case the four species of algae were similarly affected by each chemical. Of the compounds tested the most inhibitory to all four species was monochloramine. Halogenated phenols caused various responses, some of the compounds being stimulatory and others inhibiting cell division. No toxic effects were noted at tested levels of *p*-chlorophenol or 2,4,6-tribromoanisole.

See also 79-1509, 79-1510, 79-1515, 79-1516, 79-1556, 79-1589 *and* 79-1735.

79-1720. Isshiki, K. ; Tsumura, S.; Watanabe, T.* (Dep. Food Sci. & Technol., Fac. Agric., Kyushu Univ., Fukuoka 812, Japan) **Simultaneous determination of diphenyl and *o*-phenylphenol in citrus fruits.** *Agric. Biol. Chem.* 42(12): 2375-2379; 1978. (12 references)

A method of concurrent determination for diphenyl and *o*-phenylphenol in citrus fruits by gas chromatography is described. In this method, the fruits are first distilled with an oil analyzer, 3 ml of cyclohexane is added to the aqueous phase of the oil analyzer, and the distillation is carried out for 1.5 hr. The cyclohexane layer is then taken out and dried with small amounts of anhydrous sodium sulfate. One ml of internal standard solution (500 ppm of anthracene in cyclohexane) is added to the dried extract. The gas chromatography of the citrus fruit extract can then be performed. This method was applied to samples of various citrus fruits including lemons, grapefruits and oranges. The range of recovery for diphenyl was 90.1 to 96.9%, and the range of recovery for *o*-phenylphenol was 86.5 to 99.3%.

79-1721. Farrington, D. S.; Hopkins, R. G. (Dep. Ind., Lab. Gov. Chem., London SE1 9NQ, England) **Determination of ethylenethiourea in ethylenebis dithiocarbamate fungicides: comparison of high-performance liquid chromatography and gas-liquid chromatography.** *Analyst (London)* 104(1235): 111-116; 1979. (12 references)

A rapid, sensitive method is described for the determination of ethylenethiourea (imidazolidine-2-thione) in ethylenebis dithiocarbamate fungicides. High-performance liquid chromatography is used with an ultraviolet sprectrophotometric detector. The results are compared with those obtained using gas liquid chromatography. All fungicide samples assayed contained ethylenethiourea, and gas-liquid chromatography indicated higher concentrations than high-performance liquid chromatography. (Author abstract by permission)

79-1722. Ganesan, M.; Natesan, S.; Ranganathan, V. (Dep. Chem., Tea Res. Stn., United Planters' Assoc. South. India, Cinchona 642 106, India) **Spectrophotometric method for the determination of paraquat.** *Analyst (London)* 104(1236): 258-261; 1979. (10 references)

A spectrophotometric method for paraquat which involves the formation of a stable yellow chromophore is described. The sample containing paraquat as the dichloride or dimethylsulfate salt is reacted in a 25 ml volumetric flask containing ethanol (5 ml), acetone (1.5 ml) or 1% *m/V* starch solution (1 ml). The solution is diluted to 20 ml with neutral potassium tetra iodomercurate (II) solution and water is added to the mark. After 15 min, the absorbance of the yellow solution is measured at 400-420 nm. The readings are compared with a standard curve. The color is stable for up to 60 min and the method is linear for concentrations of paraquat up to 3 μg/ml. Interference tests show that the determination is not affected by sodium, potassium, ammonium, hydrogen, chloride, nitrite, sulfate, or methyl sulfate ions. Sodium 2,2-dichloro propionate, sodium 2,4-dichloro phenoxyacetate, and monosodium methanearsonate also did not interfere with the determination of two paraquat salts. Maintaining the pH between 6 and 8 eliminates interference by hydroxyl ions. Interference by diquat may be overcome by keeping the pH at 12.5-13.0 for 5-6 hr and neutralizing with acid (using phenolphthalein as indicator) before absorbance measurement. A comparison of this technique with other existing methods for paraquat shows the present method to be adequate with the added advantage of longer stability of the color complex.

79-1723. Rosewell, K. T.; Baker, B. E. (Res. Dep., General Foods Ltd., LaSalle, Quebec, Canada) **A method for confirming organochlorine pesticide residues in wildlife.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 470-477; 1979. (12 references)

Studies were performed in which samples of Harp seal tissue (blubber, liver, brain) were analyzed for organochlorine residues. The procedure involved hexane extraction, Florisil column cleanup, charcoal column separation, and dechlorination using sodium ethoxide. Gas-liquid chromatography confirmed the presence of DDT, DDD (TDE), dieldrin, PCB, and HCB (hexachlorobenzene). It was concluded that the dechlorination procedure can be used for rapid, routine confirmation of certain organochlorine compounds in wildlife samples.

79-1724. Picker, J. E.; Yates, M. L.; Pereira, W. E. (US Geol. Surv., Arvada, CO 80002) **Isolation and characterization of the herbicide dimethyl tetrachloro terephthalate by gas chromatograph mass spectrometer computer techniques.** *Bull. Environ. Contam. Toxicol.* 21(4-5): 612-617; 1979. (10 references)

Due to the contamination of lakes and streams with run-off containing DCPA (dimethyl tetrachloro teraphthalate) in the Imperial Valley of California, a gas chromatograph mass spectrometer computer technique for the detection of this compound in water was investigated. The compound was isolated by extraction with dichloromethane, dried, and concentrated to be preliminarily screened by gas chromatography. GC-MS was carried out on a column of 3% OV-101 with 100-120 mesh Gas Chrom Q, and helium was used as carrier gas. The concentration of DCPA in the water sample was determined to be less than 1 μg/l by comparison with the injected standard. It is suggested that this method would be useful in monitoring the metabolic fate and degradation of DCPA in soils and aquatic systems.

79-1725. Sattar, M. A.; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Analysis of MCPA and its metabolites in food grains and vegetables.** *Chemophere* 8(3): 143-149; 1979. (22 references)

A method for the simultaneous analysis of the herbicide 2-methyl-4- chlorophenoxyacetic acid (MCPA) and its metabolites is described. Food grain and vegetable samples were fortified with various levels of MCPA and its metabolites 4-chloro- *o*-cresol and 5-chloro- 3-methylcatechol. Sev-

eral methods of extraction and cleanup were tested, and the optimal procedure was found to be extraction of the acidified (H_3PO_4) sample with ether: acetone: hexane: heptane (2:1:1:1) followed by derivatization with pentafluorobenzyl bromide and K_2CO_3 in acetone, cleanup with TLC, and gas liquid chromatography with ECD. Under these conditions, the recovery ranged from 92.2-94% with both grain and vegetable samples.

79-1726. Luckow, V. (Chem. Inst., Tieraerztl. Hochsch., D-3000 Hannover, BRD) **Duennschiecht-chromatographischer Nachweis von IOXYNIL in biologischem Material. [Thin-layer chromatographic detection of IOXYNIL in biological material.]** *Fresenius Z. Anal. Chem.* 294(4): 288; 1979. (2 references) (German)

A thin-layer chromatographic method for the detection of lethal and sublethal doses of the herbicide (3,5-diiodo 4-hydroxybenzonitril) is described which allows identification in 10 g organic material down to a concentration of 0.1 μg/g. Organs of rats fed acute and subacute amounts of the sodium salt of IOXYNIL (50 and 20 mg in drinking water per rat respectively) were homogenized, extracted with methanol-NaOH, neutralized, purified with Celite and the filtrate was extracted with dichloromethane, evaporated and the residue was again dissolved in 1 ml dichloromethane which was used for TLC. Chromatograms were developed with benzene, the spray reagent was prepared from AgNO3, phenoxyethanol and acetone. The plates were developed under UV light and IOXYNIL appeared in the form of white spots on a brown background. Quantification was achieved by comparing the spot size with spots from 1, 2, and 5 μg standards.

79-1727. Vasundhara, T. S.; Parihar, D. B. (Defence Food Res. Lab., Mysore, India) **Microdetermination of organotin compounds by TLC and spectrophotometry using haematoxylin as reagent.** *Fresenius Z. Anal. Chem.* 294(5): 408; 1979.

A method is described for the determination of organotin compounds by spectrophotometric detection of the reddish-blue complex they form with hematoxylin which is soluble in both water and ethanol. Limits of detectability range from 0.5 μg to 5 μg. Coatings of silica gel G + 20% kieselguhr G or magnisium silicate + 40% kieselguhr G gave the most favorable results. The best solvents were found to be either isoamyl alcohol: acetic acid (9:1) or isobutanol: water: propionic acid (7:1:4). A technique is described for the determination of organotin compounds in polyvinyl chloride bottles which involves disolving of the sample in tetrahydrofuran, washing the precipitate with methanol, and applying the filtrate dissolved in dichloromethane to a TLC plate. The plate is developed with hematoxylin solution in ethanol, and the scraped off spots are eluted with ethanol and measured for optical density at 575 nm. Quantitative results are obtained by comparison with a standard curve. The R*f* values of various organotin compounds in different solvent systems are given in table form.

79-1728. Kovaleva, E. S.; Talanov, G. A. (All-Union Res. Inst. Vet. Sanit., Moscow, USSR) **Metod opredeleniya sevina v pochve i rasteniiakh s pomoshch'iu tonkosloinoi khromatografii. [Use of thin-layer chromatography for determination of Sevin content in soil and plants.]** *Gig. Sanit.* 43(7): 69-70; 1978. (1 reference) (Russian)

A thin-layer chromatographic assay for the determination of Sevin (carbaryl) residues in the soil and plant samples is described. For the mobile phase, a mixture of hexane: acetone: chloroform (3:1:0:3) was used. The R*f* values for Sevin and 1-naphthol were 0.6 and 0.9, respectively. The sensitivity of assay was 0.02 μg; detectability ranged from 80% to 95%. The assay permits simultaneous determination of a series of Sevin metabolites.

79-1729. Touchstone, J. C. ; Rodger, D. (Univ. Pennsylvania, Philadelphia, PA) **Gas chromatographen fuer die Biochemie und klinische Chemie. [Gas chromatographs for biochemistry and clinical chemistry.]** *Git. Fachz. Lab.* 22(7): 627-628; 1978. (German)

Four examples of the application of series 4000 and series 2000 gas chromatographs developed by the University of Pennsylvania and the National Institute of Health in Bethesda, MD. are described. The equipment designed specifically for clinical, toxicological and food analyses, and the detection of pesticides present in less than ng quantities operates by use of an electron capture detector. The separation of *p,p'*-DDE, *o,p'*-DDT, and *p,p'*-DDD (TDE) are described. Other examples given involve the detection of pentoses in the form of pentitol acetate derivative, the separation of rhamnose, fucose, ribose and arabinose in a 10% Carbowax 20 M column, and the separation of steroids from plasma in the form of heptafluorobutyrate derivatives (estradiol 17β, estriol, estrone, 16-α- hydroxydehydro epiandrosterone, and cholesterol).

79-1730. Greenhalgh, R. ; Mueller, J.; Aue, W. A. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ont. K1A OC6, Canada) **A pure rubidium/quartz source for alkali flame ionization detectors.** *J. Chromatogr. Sci.* 16(1): 8-11; 1978. (6 references)

The production of a pure rubidium/quartz source for alkali flame ionization detectors (AFID's) is described. Ground quartz was mixed with three different amounts of rubidium hydroxide, melted, and worked into a homogenous composition. Beads were fabricated from the materials, and nominally contained 2.4%, 7.6% and 19.6% rubidium by weight. The sensitivity, selectivity, minimum detectable amount, and linear range of the beads were assessed in a commercial AFID, and the characteristics of the different beads were described. The noise level of the rubidium bead was very low, and it was highly sensitive to phosphorous and nitrogen. The pure rubidium/quartz bead is suggested for use as an inexpensive, long-lived and easily replaced alkali source for pesticide residue analysis.

79-1731. Majors, R. E.; Johnson, E. L. (Varian Aerograph, Walnut Creek, CA 94598) **High-performance exclusion chromatography of low molecular weight additives.** *J. Chromatogr.* 167: 17-30; 1978. (11 references)

The use of high-performance exclusion chromatography with small pore-size gels of 8-10 μm particle diameter for the analyses and/or clean-up of a variety of sample types was investigated. In many cases, low molecular weight additives from polymers or oils could be determined directly since the latter were of a sufficiently higher molecular weight to be resolved. In those cases where the additives were unseparated, the exclusion techniques served as a clean-up method and these compounds could be further separated by another liquid chromatographic mode, such as reversed phase. The technique was applied to a steroid in a cream base, polyethylene additives, sulfur in a compounded rubber and a pesticide formulation, DDT in butter and additives in vegetable and lubricating oils. (Author abstract by permission)

79-1732. Hall, R. C.; Harris, D. E. (Environ. Toxicol. Div., Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Direct gas chromatographic determination of carbamate pesticides using Carbowax 20M modified supports and the electrolytic conductivity detector.** *J. Chromatogr.* 169: 245-259; 1979. (39 references)

The gas chromatographic behavior of 32 carbamate pesticides was investigated using the Hall electrolytic conductivity detector. Relative retention indices were successfully determined for 24 carbamates on six different columns. Columns investigated included Ultra-Bond, 3% OV-101 on Ultra-Bond, 1% OV-17 on Ultra-Bond, 1% OV-210 on Ultra-Bond, 1% Carbowax 20M on Ultra-Bond and 0.5% OV-210 + 0.65% OV-17 on Ultra-Bond. Chemical-ionization gas chromatography mass spectrometry was used to verify that the carbamate were chromatographed intact. Chemical ionization mass spectra are reported. Analytical procedures are demonstrated for the determination of carbamate residue in soil. (Author abstract by permission)

79-1733. Matisova, E.; Krupcik, J.; Liska, O.; Szentivanyi, N. (Chem. Fac., Dep. Anal. Chem., Slovak Tech. Univ., CS-88037, Bratislava, Czechoslovakia) **Qualitative analysis of multi-component *s*-triazine herbicides by gas-liquid chromatography.** *J. Chromatogr.* 169: 261-269; 1979. (10 references)

It has been found that in the analysis of multi-component mixtures of *s*-triazines on packed columns some problems arise in that on non-polar stationary liquids (OV-101, SE-30) many peaks of *s*-triazines overlap and some peaks are not symmetrical, depending on the support material. Separations on a polar phase (Carbowax 20M) were better, but still inadequate. A complex mixture of chloro-, methoxy- and methylthio- *s*-triazines was separated successfully on high resolution glass capillary columns coated with Carbowax 20M. The optimal temperature for the analysis of *s*-triazines was determined from the dependence of log *tR*, on 1/T. For the characterization of *s*-triazines in environmental samples, Kovats retention indices were measured on glass capillary columns with dynamically coated non-polar (OV-101) and polar (Carbowax 20M) stationary liquids. The relationship between the structures of the *s*-triazines and their retention data was studied. (Author abstract by permission)

79-1734. Brown, P. M.; Chana, J. S. (Vertebr. Biochem. Sect., Pest Infest. Control Lab., Minist. Agric. Fish. & Food, Surbiton, Surrey KT6 7NF, England) **Interference by warfarin in the detection of carbamate insecticides on thin-layer chromatograms by an esterase inhibition technique.** *J. Chromatogr.* 169: 407-408; 1979. (8 references)

The interference by warfarin in carbamate insecticide analysis by thin-layer chromatography was demonstrated by an esterase inhibition technique. Glass plates coated with silica gel G or silica gel GF254 were spotted with warfarin and several carbamate pesticides. The *n*-hexane: acetone (60:40) solvent was allowed to ascend to the 150 mm mark in a closed tank saturated with solvent vapor. After evaporation of the solvent the plates were sprayed with a solution of outdated human blood plasma in aqueous tris (hydroxymethyl) methylamine buffer and were left at room temperature for 20 min to allow for the occurrence of inhibition. The substrate spray reagent consisting of 2-naphthyl acetate dissolved in absolute ethanol and coupling reagent solution (diazonium salt of *o*- dianisidine) in distilled water was applied to the plates and the magnenta background color appeared within 20 min. White spots occurred where hydrolysis of the 2-naphthyl acetate to 2-naphthol had not taken place. Warfarin was detectable at minimum levels of 0.5 μg and aldicarb was present in amounts as low as 0.5 ng. The R*f* range of warfarin was 0.33 on 400 μm silica gel G to 0.44 on 200 μ m silica gel GF254. It was demonstrated that the detection of warfarin by this method involves enzyme inhibition and not direct reaction with the substrate or interference with the coupling reaction. These findings illustrate that the detection of a spot on a TLC place by esterase inhibition does not always mean an organophosphorus or carbamate pesticide is responsible.

79-1735. Edgerton, T. R.; Moseman, R. F.; Linder, R. E.; Wright, L. H. (Environ. Toxicol. Div., Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Multi-residue method for the determinatin of chlorinated phenol metabolites in urine.** *J. Chromatogr.* 170(2): 331-342; 1979. (10 references)

Electron-capture gas chromatographic (EC-GC) methods for the determination of chlorinated phenol metabolites of hexachlorobenzene (HCB) and pentachlorophenol (PCP) in urine are presented. After extraction the sample was reacted with diazomethane to produce the methyl ether of each metabolite prior to determination by EC-GC. An acid alumina column was used for cleanup and separation of methylated phenols into groups. Average recoveries of greater than 80% were obtained from urine fortified with known amounts of the phenol metabolites under investigation. A level of 1 ppb was established as minimum detection limit for

each phenol metabolite. Previously unreported urinary metabolites of HCB and PCP were found as a result of a rat feeding study. Levels of chlorinated phenol residues from the human general population and a worker occupationally exposed to PCP are also included. (Author abstract by permission)

79-1736. Davies, R. D. (Inst. Chromatogr., Univ. Pretoria, Pretoria, South Africa) **Detection limits for some carbamate and phenylurea pesticides by high-performance thin-layer chromatography.** *J. Chromatogr.* 170(2): 453-458; 1979. (20 references)

A high-performance thin-layer chromatographic (HPTLC) method for the detection of carbaryl, propoxur, aldicarb and diuron is described. Pure samples of the compounds were spotted on the plates and developed in chloroform. R*f* values were approximately 0.28 for carbaryl, 0.18 for propoxur, 0.19 for aldicarb, and 0.10 for diuron. Detection was carried out by six different techniques: UV quenching, NaOH treatment, $AgNO_3$ treatment, *p*-nitrobenzene diazonium tetrafluoborate treatment, Fisetin treatment, and enzyme inhibition, which are discussed. Out of these methods, enzyme inhibition, *p*-nitrobenzene diazonium tetrafluoborate, $AgNO_3$, and UV quenching yielded the most reproducible results for the carbamates. Results for residue detection of carbamates in fruits and vegetables using HPTLC compared favorably with results obtained using TLC. For the phenylurea pesticide, diuron, the present method appeared to be more sensitive than conventional TLC techniques.

79-1737. Chapman, R. A.; Harris, C. R. (Res. Inst., Agric. Canada, London, Ont. N6A 5B7, Canada) **Determination of residues of methomyl and oxamyl and their oximes in crops by gas-liquid chromatography of oxime trimethylsilyl ethers.** *J. Chromatogr.* 171: 249-262; 1979. (16 references)

The gas-liquid chromatographic behavior of methomyl (methyl *N*- [(methylcarbamoyl)oxy] thioacetimidate), oxamyl (methyl *N*',*N*'- dimethyl-*N*- [(methylcarbamoyl)oxy]- 1- thiooxamimidate), their respective oxime hydrolysis products and the trimethylsily (TMS) ethers of the oximes on 5% OV-1 was studied under isothermal conditions using a flame-photometric detector in the sulfur-selective mode. In contrast to the behavior of the parent carbamates and underivatized oximes, the oxime-TMS ethers readily produced symmetrical peaks of consistent size. Quantities of derivatives equivalent to at least 0.25 ng of oxime were easily measurable. Derivative formation was reproducible for standards over the range 10.0 to 0.25 μg/ml in benzene and at 10.0 and 0.50 μ g/ml in the presence of extracts from tomato, carrot and celery at concentrations equivalent to 10 g/ml of crop. Derivative yields from crop extract fortifications were 89% or better in most cases. Both the carbamates and oximes were simply and consistently recovered in high yield from crops fortified at 1.00 and 0.05 ppm using the procedures described. The inclusion of a second analytical step provided separate analysis for oximes and carbamates. The application of these observations to the analyses of residues in crops is discussed. (Author abstract by permission)

79-1738. Deleu, R.; Copin, A. (CRUPA, Sect. Probl. Environ., IRSIA, Lab. Chim. Anal., Fac. Sci. Agron. Etat, B-5800 Gembloux, Belgium) **Extraction et dosage par chromatographie en phase gazeuse des herbicides nitrofene et neburon. Application a des eaux naturelles. [Extraction and gas-liquid chromatographic determination of the herbicides nitrofen and neburon. Application to natural water.]** *J. Chromatogr.* 171: 263-268; 1979. (12 references) (French)

A gas chromatographic method for the simultaneous determination of nitrofen and neburon in various types of waters is described. Different parameters for gas chromatography were tested to achieve the best method for temperature programming of nitrofen and neburon analysis from a single injection. After manual extraction of the pesticides from small volumes of tap, river, or runoff water, the chloroform is evaporated off and the residues are dissolved in 5 μl of benzene for injection into the gas chromatograph. Nitrofen was detected at limits of 2.5 ± 0.25 pg, and neburon at levels of 100 ± 5 pg. The method has proved practically quantitative for the detection of these two pesticides simultanously in natural waters.

79-1739. Cotterill, E. G. (Agric. Res. Counc., Weed Res. Organ., Oxford OX5 1PF, England) **Rapid simultaneous determination of residues of MCPA, mecoprop and MCPB in soil by gas chromatography of the pentafluorobenzyl ester.** *J. Chromatogr.* 171: 478-481; 1979. (9 references)

Soil samples fortified with aqueous solutions of the sodium salts of MCPA, MCPB, and mecoprop were analyzed by a gas chromatographic technique designed to detect the pentafluorobenzyl ester. Esterification of the acids was performed to limit the amount of isomerization and increase chromatographic volatility. Standards of each herbicide were prepared in the range of 0.01 ng/5 μl to 0.2 ng/5 μl. Gas chromatography using ^{63}Ni electron-capture detection was performed with digital integration of the peak areas. The detection limit, based on a response of about twice the background signal, was 0.05 ppm. The only other solvent system which gave satisfactory results was diethyl ether: acetone: hexane: heptane (2:1:1:1). The average recoveries of mecoprop from soil by different solvent systems were compared to evaluate the efficiencies of each method. The present method was found to be rapid and simple for the determination of herbicides in soil, with good recovery for all three compounds at the 0.1 ppm level.

79-1740. Smith, A. E.; Hayden, B. J. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Method for the determination of 2,4-dichloro phenoxyacetic acid residues in urine.** *J. Chromatogr.* 171: 482-485; 1979. (16 references)

As part of a continuing project to monitor the possible presence of 2,4-D in the urine of spray operators in the

Canadian prairies, a method for the determination of residues of this herbicide in urine specimens was examined. Five males ranging in age from 25 to 55 yr provided the urine specimens. Some of the specimens were used as controls while others were fortified with 40 μl of a methanol solution containing 2,4-D. Final concentration of the herbicide in the urine was 0.1 ppm. A glass chromatography column containing Amberlite XAD-2 resin was used for cleanup of the samples. The methyl ester of 2,4-D was detected by gas chromatography and the presence of 2,4-D was confirmed by *trans*-butylation to the *n*-butyl ester of 2,4-D. 2,4-D was recovered from the 5 fortified urine specimens with a mean recovery of 94 ± 6%. No interference was noted from extraneous substances. A recovery of 90% was attainable in urine samples refrigerated for up to 5 days at 4°C. The XAD-2 resin cleanup procedure was found to be rapid and satisfactory for the extraction and analysis of 2,4-D methyl ester at the 0.1 ppm level in urine.

79-1741. Meijs, A. W. H. M.; Ernst, G. F. (Food Insp. Serv., Rotterdam, The Netherlands) **Rapid gas chromatographic method for the determination of Kepone in the eel.** *J. Chromatogr.* 171: 486-489; 1979. (8 references)

Due to the contamination of the James River with the pesticide Kepone (chlordecone), and the possible contamination of eels from the river that are imported by The Netherlands, a gas chromatographic method for the determination of this compound in eels was investigated. A 20-g sample of chopped eel was macerated with anhydrous sodium sulfate in 100 ml of isopropanol: chloroform (1:1). After 16 hr the sample was centrifuged and the extract was washed by extraction with *n*-hexane and acetonitrile. Column chromatography was used for sample cleanup and after the residue was dissolved in 5 ml of isopropanol, a 5 μl volume of the solution was injected into the gas chromatograph. Kepone was detected in the second eluate at limits of 0.005 ppm. Extraction with isopropanol: benzene (1:1) or isopropanol: toluene (1:1) also proved successful for the analysis of Kepone residues in eel tissues. Maceration of the tissue with *n*-hexane or Soxhlet extraction with *n*-hexane gave only 25% and 50%, respectively of the amount of Kepone recovered with the present method. Little interference from other compounds was found when 48 samples of fresh, smoked or frozen eel were analyzed. Identification of Kepone in positive samples was achieved by gas chromatography mass spectrometry.

79-1742. Balba, H. M.; Still, G. G.; Mansager, E. R. (Uniroyal Chem., Naugatuck, CT 06770) **Pyrolytic method for estimation of bound residues of chloroaniline compounds in plants.** *J. Assoc. Off. Anal. Chem.* 62(2): 237-240; 1979. (6 references)

With one exception, pyrolysis in the absence of oxygen of different forms of bound ^{14}C-chloroaniline residues released more than 80% of the radioactivity as volatile products. Gas chromatography mass spectrometry of the pyrolysates indicated that the major radioactive products were the chloroaniline compounds. The pyrolysates were collected, purified, and derivatized to the corresponding trifluoroacetanilides and these derivatives were analyzed by electron capture gas chromatography. Materials used as bound residues were model synthetic ligin- ^{14}C-chloroaniline polymers, bound residue fractions, and lignin fractions isolated from the roots of rice plants treated hydroponically with ^{14}C-3-chloroaniline or ^{14}C-3,4-dichloroaniline. (Author abstract by permission)

79-1743. LaBel, G. L.; Williams, D. T.; Griffith, G.; Benoit, F. M. (Health Prot. Branch, Health & Welfare Canada, Environ. Health Dir., Ottawa, Ont. K1A OL2, Canada) **Isolation and concentration of organophosphorus pesticides from drinking water at the ng/l level, macroreticular resin.** *J. Assoc. Off. Anal. Chem.* 62(2): 241-249; 1979. (22 references)

A screening method has been developed for determining organophosphorus pesticides at ng/l levels in drinking water. Sixteen organophosphorus pesticides, diazinon, diazinon-oxon, dimethoate, ronnel, β-phosphamidon, methyl parathion, parathion, malathion, chlorpyrifos, fenitrothion, Reulene (crufomate), methidathion, ethion, EPN, phosphalone, and phosmet, were extracted by Amberlite XAD-2 resin from 100 and 200 l drinking water previously spiked with these pesticides. The pesticides were eluted from the XAD-2 resin with acetone-hexane (15+85). The concentrated extract was analyzed by gas chromatography using a nitrogen-phoshorus selective detector and by gas chromatography mass spectrometry using selection ion monitoring. Recoveries at the 10 and 100 ng/l spiking levels were greater than 90%, except recoveries for dimethoate and phosphamidon were 37 and 42%, respectively. The analysis of 300 l of Ottawa tap water showed no detectable amounts (< 1 ng/l) of any of the 16 organophbosphorus pesticides. (Author abstract by permission)

79-1744. Wayne, R. S. (Am. Cyanamid Co., Princeton, NJ 08540) **Collaborative study of the gas-liquid chromatographic determination of malathion in formulations and technical materials.** *J. Assoc. Off. Anal. Chem.* 62(2): 292-296; 1979. (7 references)

A gas-liquid chromatographic method was studies collaboratively for determining malathion in wettable powders, and emulsifiable concentrate, a dust, and the technical grade product. Flame ionization detection, *m*-diphenoxybenzene as the internal standard, and a column containing 5% SP-2401 or OV-210 on 100-120 mesh Gas-Chrom Q or Supelcoport were used for the determination. Agreement between replicates in individual laboratories was excellent. Agreement between laboratories was satisfactory. The method offers improved specificity and ease of operation when compared to the official first action methods. The method has been adopted as official first action. (Author abstract by permission)

79-1745. Stevens, T. S. (Anal. Lab., Dow Chemical, Midland, MI 48640) **Assay of formulations containing 2,4-D**

and/or picloram by direct injection high pressure liquid chromatography. *J. Assoc. Off. Anal. Chem.* 62(2): 297-303; 1979. (6 references)

A rapid and precise fully automated, direct injection high pressure liquid chromatographic method is described for assaying liquid formulations of 2,4-dichloro phenoxyacetic acid (2,4-D) and/or picloram (4-amino- 3,5,6-trichloro picolinic acid). The method is specific for the 2,4-D and picloram isomers. No sample preparation is needed, triplicate assays can be performed in 1 hr, and precision is about 1%, relative at the 95% confidence level. Compounds are separated on a 9 mm id reverse phase microparticulate column with an eluant of acetronitrile: water (1+4), buffered at pH 2.95. No bias was observed between this method and the official final action HPLC method for picloram and 2,4-D in picloram 2,4-D mixtures. (Author abstract by permission)

79-1746. Stahr, H. M.; Gaul, M.; Hyde, W.; Moore, R. (Vet. Diagn. Lab., Iowa State Univ., Ames, Iowa) **A cellulose column clean-up for organophosphorus pesticides.** *Microchem. J.* 24(1): 97-101; 1979. (3 references)

A cleanup procedure using a cellulose column is described for use in organophosphorus pesticide analysis. With this process, the sample (a mixed feed sample) was extracted with acetonitrile, followed by hexane. The extract was concentrated, then added to a column which was packed with cellulose CF-11 and activated at 85°C, and 35 inches of vacuum overnight. After addition of hexane and hexane-benzene, the eluates were collected and concentrated and analyzed by gas chromatography, high performance liquid chromatography, thin layer chromatography, or GC/mass spectrometry. The range of recovery was 80-90% for organophosphorus pesticides and 50-70% for carbamates.

79-1747. Welling, W.; de Vries, A. W.; Houx, N. W. H.; Jongen, W. M. F. (Lab. Res. Insectic., Wageningen, The Netherlands) **Structure assignment to biologically produced malathion monocarboxylic acid isomers with ^{13}C-nuclear magnetic resonance.** *Pestic. Biochem. Physiol.* 10(1): 60-66; 1979. (8 references)

A mixture of two structural isomers was obtained through the chemical synthesis of malathion α- and β-monocarboxylic acids. The main product of the synthesis was the β-isomer. The α-isomer was present in far smaller quantities. When rat liver fractions were incubated with malathion *in vitro*, the α- and β-monoacids were formed in the ratio of 3:2. When malathion was given to rats as ip injections, the ratio was 9:2 for these metabolites as they were excreted into the urine.

79-1748. Loebering, H. G.; Weil, L.; Quentin, K. E. (Inst. Wasserchem. & Chem. Balneol., Tech. Univ. Muenchen, D-8000 Munich, BRD) **Bestimmung von herbiziden und insektiziden Carbamate in Wasser. [Determination of carbamate-containing herbicides and insecticides in water.]** *Vom Wasser* 51: 265-271; 1978. (14 references) (German)

Gas chromatographic quantitative analysis of a model water sample containing 8 carbamates, increasingly used as herbicides and insecticides because of their low persistence, is described. Extraction is accomplished with dichloromethane, an acetic acid ester or a mix of toluene and an acetic acid ester. The dried extract must be subjected to derivatization; conversion to stable trifluoroacetyl derivatives because of the thermal instability of carbamates. This is accomplished by combining a solution of the dried extract in toluene with trifluoracetic acid anhydride, transferring the trifluoroacetyl derivatives into a small amount of water and drying over Na_2SO_4. Gas chromatography is then carried out in a 5750 G model Hewlett-Packard column. The method is applicable to a concentration of between 5-50 ng carbamate/l drinking or non-polluted ground water. Recovery rates in percent in communal waste water containing 1-5 ng carbamate mix were: carbaryl, 78%; chlorpropham, 90%; chlorbutam, 92%; nesural, 30%; phenmedipham, 63%; promecarb, 71%; propham, 81%; and propoxur, 74%.

79-1749. Stoeber, I.; Reupert, R. (Landesanst. Wasser & Abfall NW, D-4000 Duesseldorf 1, BRD) **Zur Bestimmung von Phenylharnstoff-Herbiziden und Carbamaten im Oberflaechewasser mittels der Hochdruck-Fluessigkeits-Chromatographie. [Determination of phenylurea herbicides and carbamates in surface water by means of high performance liquid chromatography.]** *Vom Wasser* 51: 273-283; 1978. (16 references) (German)

The quantitative analysis of phenylurea herbicides and carbamates involves twice repeated extraction of the water sample with chloroform and subsequent selective separation into individual fractions by gradient elution on silica gel columns. Direct quantitative determination from the crude extract is not feasible because the substances to be determined are completely superimposed. Each fraction is then purified by reversed phase chromatography over reversed phase materials (RP-C8) to rid the sample of less polar components whose presence would reduce the life of the very expensive columns. The combined fractions are then analyzed by HPLC using two different columns alternatively. Following separation on the HPL chromatograph, individual substances are identified by field desorption mass spectrometry. The detection threshold for phenylurea herbicides is 1 ng, and for carbamates 1-2 ng. In almost all surface water samples analyzed by this method, chlortoluron, diuron, linuron and metoxuron were found.

79-1750. Schaffernicht, H. (Lehrstuhl Arbeitshyg., Kark Marx Univ., DDR-701 Leipzig, DDR) **Die analytische Bestimmung chlorierter Naphthaline in arbeitshygienisch bedeutsamen Konzentrationsbereichen. [Analytical determination of chlorinated naphthalenes in concentrations occurring in the working environment.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 24(12): 893-895; 1978. (3 references) (German)

Photometric and gas-chromatographic methods for the determination of chlorinated naphthalenes in air are described. For the photometric determination, the test sub-

stance is adsorbed in concentrated sulfuric acid, and then nitrated with concentrated nitric acid. After sodium hydroxide solution and water are added, the yellow nitrated product is determined photometrically at 420 nm. The detection limit is 0.007 mg for xylamone in a 0.5 ml sample. Aromatic hydrocarbons, their derivatives, and all substances that have yellow nitrated products in alkali media interfere with the determination. For the gas-chromatographic determinations, the chlorinated naphthalenes are adsorbed on activated carbon, desorbed with carbon disulfide, and the eluate is injected into the evaporator at 573°K. A 1 m column with 10% polyethylene on Sterchamol is used for separation at 473°K. The detection limit is 87 μg in a 3 μl sample. A comparison of the two methods showed that the photometric method is simpler and more accurate.

See also **79-1547.**

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